CASE STUDY

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# The required skills for the pilot to perform the Attack Action with the AH-2 Sabre: a curricular analysis

*Las competencias necesarias al piloto para el cumplimiento de la Acción de Ataque con el AH-2 Sabre: un análisis curricular*

*As competências necessárias ao piloto para o cumprimento da Ação de Ataque com o AH-2 Sabre: uma análise curricular*

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**ABSTRACT**

The objective of this research is to verify to what extent the curricular content of the Operational Specialization Course in Rotary Wing Aviation (CEOAR), taught by the First Squadron of the Eleventh Aviation Group (1st/11th GAV), responsible for helicopter pilot training of the Brazilian Air Force (FAB), develops the necessary skills for the pilot who will perform the Attack Action with the AH-2 Sabre. From a theoretical framework, methods that enabled the collection of the desired data have been applied. Thus, the necessary competences for the pilot who will perform the Attack Action with AH-2 have been determined by a survey with the application of the Delphi Method (expert opinion) in two rounds that resulted in 15 knowledge, 17 skills and 20 attitudes. The competences developed in the CEOAR, in turn, were extracted by documentary research of the Minimum Curriculum and its Order of Instruction. The correlation of these lists revealed that the current curriculum of the CEOAR is efficient for the proposal to develop, although superficially in some cases, 100% of the knowledge, 82% of the skills and 95% of the desired attitudes, as presented in the analysis of the data.

**Keywords:** Competences. Curriculum. AH-2 Sabre. Rotary wing aviation.

***RESUMEN***

*El propósito de esta investigación es verificar en qué medida el contenido curricular del Curso de Especialización Operacional en la Aviación de Alas Rotativas (CEOAR), impartido por el Primer Escuadrón del Undécimo Grupo de Aviación (1er/11º GAV), responsable de la formación de pilotos de helicóptero de la Fuerza Aérea Brasileña (FAB), desarrolla las competencias necesarias al piloto que cumplirá la Acción de Ataque con el AH-2 Sabre. A partir de un marco teórico, se aplicaron métodos que posibilitaron la recolección de los datos deseados. Así, las competencias necesarias para el piloto que cumplirá la Acción de Ataque con el AH-2 fueron obtenidas por investigación de levantamiento, con la aplicación del Método Delphi (opinión de especialistas) en dos rondas que resultaron en 15 conocimientos, 17 habilidades y 20 actitudes . Las competencias desarrolladas en el CEOAR, a su vez, fueron extraídas por investigación documental del Currículo Mínimo y de su Orden de Instrucción. De la correlación de esas listas se verificó que el currículo actual del CEOAR es eficiente para la propuesta en pauta por desarrollar, aunque superficialmente en algunos casos, el 100% de los conocimientos, el 82% de las habilidades y el 95% de las actitudes deseadas, como presentado en el análisis de datos.*

***Palabras clave:*** *Habilidades. Currículo. AH-2 Sabre. Aviación de alas rotativas.*

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The acronyms and abbreviations contained in this article correspond to the ones used in the original article in Portuguese.

***RESUMO***

*O objetivo desta pesquisa é verificar em que medida o conteúdo curricular do Curso de Especialização Operacional na Aviação de Asas Rotativas (CEOAR), ministrado pelo Primeiro Esquadrão do Décimo Primeiro Grupo de Aviação (1º/11º GAV), responsável pela formação dos pilotos de helicóptero da Força Aérea Brasileira (FAB), desenvolve as competências necessárias ao piloto que cumprirá a Ação de Ataque com o AH-2 Sabre. A partir de um referencial teórico, aplicaram-se métodos que possibilitaram a coleta dos dados desejados. Assim, as competências necessárias ao piloto que cumprirá a Ação de Ataque com o AH-2 foram obtidas por pesquisa de levantamento, com a aplicação do Método Delphi (opinião de especialistas) em duas rodadas que resultaram em 15 conhecimentos, 17 habilidades e 20 atitudes. As competências desenvolvidas no CEOAR, por sua vez, foram extraídas por pesquisa documental do Currículo Mínimo e da sua Ordem de Instrução. Da correlação dessas listas verificou-se que o currículo atual do CEOAR é eficiente para a proposta em pauta por desenvolver, ainda que superficialmente em alguns casos, 100% dos conhecimentos, 82% das habilidades e 95% das atitudes desejadas, conforme apresentado na análise dos dados.*

***Palavras-chave:*** *Competências. Currículo. AH-2. Sabre. Aviação de asas rotativas.*

## 1 INTRODUCTION

In order to be able to contribute to the defense of the homeland, guarantee the constitutional powers, law and order, the Brazilian Air Force (FAB) has as its permanent and prevailing objective the preparation of its means to carry out airborne operations, prioritizing the maintenance of the appropriate level of training of their equipment.

In the event of a conflict, it should still be able to use its means of combat under its command, in single operations and in joint and combined operations (with other national and/or foreign armed forces) (BRAZIL, 2010).

In this context, one of the means referred to in the previous paragraph is the Rotary Wing Aviation. The training of FAB helicopter pilots begins when, at the end of the Aviator Officers Training Course, in the Air Force Academy, the Aviator Officer Aspirants are assigned to perform the Operational Specialization Course in Rotary Wing Aviation (CEOAR ), taught by the First Squadron of the Eleventh Aviation Group (1st/11th GAV). Such aviators are called trainees during the course and they will also be referred this way in this article.

One of the main features of the helicopter is the versatility, which makes it capable of accomplishing several types of mission, from rescues and aeromedical evacuations to airborne combat and ground attacks. To exploit such capabilities, FAB has six squadrons that operate rotary wing aircraft and have specific missions. At this point, the complexity of the 1st/11th GAV mission is demonstrated, which includes providing the trainees with the knowledge and training for operational use in Air Force Actions performed by Rotary Wing Aviation, through theoretical and practical instructions (BRAZIL, 2016a). In analogy with Fixed-Wing Aviation, it is as if a single course was responsible for specializing fighter, transportation, patrol and reconnaissance pilots, since the 1st/11th GAV should develop the necessary skills, for both the pilots who will act in the Search and Rescue Action and those who will perform Attack Action.

By having to embrace such a range of Air Force Actions, the CEOAR becomes a complex course with varying phases that aim to encompass the specificities of all FAB Rotary Wing squadrons so that trainees develop a general knowledge of the helicopter capabilities as well as skills they will use to assist the mission of the squadron to which they will be moved. The phase of weaponry use, including both front-end and pilot-operated weapons, for example, is indispensable for pilots who will be assigned to the Second Squadron of the Eighth Aviation Group (2nd/8th GAV), but this knowledge will not be used by pilots assigned to the other rotary wing squadrons. Likewise, trainees perform a Theoretical Course of Search and Rescue (CTBS), necessary for pilots who will fly in the Second Squadron of the Tenth Aviation Group (2nd/10th GAV), whose knowledge will not be used by those who are moved to the 2nd/8th GAV.

The CEOAR is defined in its Assessment Plan as

> A set of **teaching activities** whose purpose is to provide learning experiences that **enable the trainee to discriminate and apply principles, concepts, norms and procedures** necessary for the use of helicopters in specific Air Force Actions established by COMGAR. (BRAZIL, 2016b, p.12, author´s emphasis).

In addition to the trainee's specialization as a helicopter pilot, the CEOAR seeks to encourage the development of military, intellectual and professional attributes, as well as the ethical and moral standards desirable to an Air Force officer. It promotes patriotism, training for command and leadership, knowledge on the use of air power and the formation of a critical vision for the suggestion of suitable solutions for the development of the Rotary Wing Aviation.

In this context, in order to investigate to what extent the curriculum developed in the CEOAR is able to develop the competences required for the FAB helicopter pilots, considering knowledge (know-how), skills (expertise) and attitudes (want to do) worked throughout the course, this research was limited to the verification of the development of the necessary competences in the accomplishment of the Attack Action with rotary wing aircrafts, considering its importance and its specificity, since it is assigned to only two of the helicopter squadrons of the FAB: The Fifth Squadron of the Eighth Aviation Group (5th/8th GAV) and the Second Squadron of the Eighth Aviation Group (2nd/8th GAV).

This work was limited to the accomplishment of attack missions with AH-2 Sabre, FAB´s attack helicopter, taking into account the differences of the piloting in this aircraft, in comparison with the other types of helicopters. This delimitation considered the experience of the author, who formed the Crew Board of the 2nd/8th GAV for nine years and today is an instructor of the CEOAR.

Considering that a learning curriculum must be elaborated based on the competences that are intended to be developed (SACRISTÁN, 2000), the following question arises: to what extent does the curriculum content of the CEOAR develop the necessary competences for the pilot who will perform the Attack Action with AH-2 Sabre?

In order to obtain the desired answers, the following Guiding Questions (GQ) have been set forth:

GQ1: What competences are needed by the pilot to perform the Attack Action with the AH-2 Sabre?

GQ2: What competences are developed in the CEOAR?

In order to propose solutions to these questions, this research work has the general objective of identifying the extent to which the CEOAR curriculum develops the necessary competences for the pilot who will perform the AH-2 Sabre Attack Action. In order to achieve this objective, the following Specific Objectives (SO) have been set forth as well:

SO1: check along with experts, what competences are necessary for the pilot who will perform the Attack Action with the AH-2 Sabre.

SO2: identify which competences are developed in the CEOAR, based on the study of the Minimum Curriculum and its Order of Instruction.

The research on the subject matter of this article addresses the Education in the Air Force as research line, since it aims to verify if the current curriculum of the CEOAR is in accordance with the mission assigned to the 1st/11th GAV, regarding the preparation of the pilot of helicopters who will be assigned to the 2nd/8th GAV and will perform the Attack Action with the AH-2 Sabre.

More than a budget issue or an efficiency test, its importance relies on the understanding that the adequate development of knowledge, skills and attitudes during the training period is essential to enable the continuity in the development of competences in the Operational Squad to which the trainee will be assigned.

## 2 THEORETICAL FRAMEWORK

According to Perrenoud (1999: 7), competence is defined as "... ability to act effectively in a given type of situation, supported by knowledge, but not limited by it."

Competence is combined with the ability to innovate, to go beyond what is predicted, to seek partially original solutions, according to the singularity of the present situation, is extrapolated to the simple memory of past experiences (PERRENOUD, 1999, 31).

Santos (2001) establishes a correlation between the management of competences and the training that a professional must possess to perform satisfactorily a certain position. It also emphasizes the holistic meaning of these competences, including not only the knowledge and skills required to perform a given activity, but also attitudes linked to the good performance in the referred activity.

In line with this thinking, Rabaglio (2001) states that competence is based on three dimensions: knowledge, skills and attitudes (KSA). The combination of these three initials defines KSA, which is a set that encompasses not only the technical questions (knowledge - know-how), but also the capacity to use knowledge (skills - expertise) and behavior toward tasks (attitudes - want to do), as follows.

K (knowledge - know-how): to know technical manuals related to aviation, to know important tactics and techniques for the accomplishment of a certain type of flight, to know standards relevant for the development of piloting and (or) to accomplish a certain mission, etc.;

S (skill - expertise): ability to use knowledge in practice (practice the know-how) - know how to plan a particular type of mission, how to use specific tactics and techniques, how to operate the aircraft in certain conditions, etc.; and

A (attitude - want to do): behavior that leads us to apply knowledge and skills in the execution of a certain task - to seek improvement in a certain tactic or technique of flight, to apply correctly the knowledge present in the flight manuals, etc.

The concept of curriculum becomes equally important for the development of this work. Sacristán (2000, p.16) defines curriculum as "The context of practice, at the same time as it is contextualized by it" and argues that it is not limited to a relation of intellectual contents to be learned, but intends to reflect the educational and cultural socializing scheme of the school institution. Corroborates the idea that it goes beyond the simple transmission of knowledge but develops skills and attitudes appropriate to an end-goal. According to the author, the curriculum establishes the teaching strategies that will be used to achieve the proposed educational goal. It also emphasizes the importance of curricular analysis, including its contents and forms, as basic for understanding the mission of the institution.

Sacristán (2000) argues for the importance of constant analysis of didactic contents for the improvement of school curricula. These should work as flexible and dynamic instruments, so that they remain effective according to the proposed objective. Thus, a well-structured curriculum that develops the competences considered necessary for the correct performance of an activity will be more efficient in the training of a well-prepared professional for the accomplishment of its attributions.

In the case of the CEOAR, ICA 37-551 - Minimum Curriculum of the Operational Specialization Course on Rotary Wing Aviation - is the FAB document that establishes the minimum program content to be developed, setting the contents to be taught in the various phases of the Course. It encompasses the ground and air instruction (BRAZIL, 2016a).

Regarding to air instruction, the objectives, exercises, levels to be achieved, mission development, the SIPAER Risk Management Method (MSGR), as well as the mission-specific special and safety recommendations are set out in the Instruction Orders (BRAZIL, 2015).

It is also important to consider the following definition of Attack Action, according to the Basic Doctrine of the FAB - DCA 1-1.

> It is the Action that consists of using Air Force Means to neutralize or destroy enemy targets, previously located and identified. (BRAZIL, 2012, page 51).

It is also noted the difference between Air Force Action and Air Force Mission, conceptualized in the same document:

> Air Force Action: Act to employ, at the tactical level, Air Force Means to cause one or more desired effects in a campaign or military operation. It involves lethal and non-lethal Aerospace Power employment actions as well as specialized actions designed to support and complement the Air Force's operational capability. (BRAZIL, 2012, p.9)

> Air Force Mission: Air Force action assigned to an aircraft commander, aircraft formation leader, commander of ground unit or commander of troop fraction, for the purpose of achieving tactical objectives. (BRAZIL, 2012, p.10)

Thus, the investigation was conducted based on the theoretical framework exposed, the analysis of the documents that govern the CEOAR and its correlation with the competences (knowledge, skills and attitudes) required by the pilot who will perform the Attack Action with AH-2 Sabre. Thus, it is intended to address to the proposed research problem by identifying, in percentage terms, to what extent the competences required to carry out the task in question are developed in the CEOAR and, consequently, whether the current curriculum is adequate or needs any adjustment.

## 3 METHODOLOGY

SAccording to the definitions of Gil (2010) and considering the general objective of this scientific work, the research is classified as descriptive, since it aims to identify the necessary competences for the pilot who will perform the Attack Action with the AH-2 Sabre and those developed in the CEOAR.

Based on the technical procedures used, according to Gil (2010), it is classified as survey research, for identifying the necessary skills for the pilot who will perform the Attack Action with the AH-2 Sabre through the application of questionnaires, answered by a group of experts (SO1) and as documentary research, for identifying the competences developed in the CEOAR through the analysis of documents that govern the functioning of the course (SO2).

In order to achieve SO1, the experts' method, called Delphi by rounds, as suggested by Santos (2001), was adopted in this article. This method defines a group of experts who will answer questionnaires, individually and without contact with the opinions of the others, in order to determine the competences required for the pilot who will accomplish the AH-2 Sabre Attack Action, based on KSA (knowledge, skills and attitudes). Among the methods registered in the scientific literature for the determination of competences, the Delphi Method was selected, given the simplicity of its application and to guarantee impartiality in the opinion of each of the experts.

The AH-2 Sabre instructors, FAB's attack helicopter, were considered experts, given the experience of these pilots in the training of attack missions with this aircraft and their participation in the development and improvement of the skills required for the pilots newcomers to the 2nd/8th GAV.

From this universe of instructors, the sample of this research was confined to the eleven instructors belonging to the 2nd/8th GAV personnel, considering that they are the most updated regarding the concerned competences. Thus, questionnaires were sent to these pilots, obtaining a response rate of 90.9%; therefore, a total of ten different opinions.

In order to check the minimum size for the reliability of the sample and the sample error for the present survey, the definition of Crespo (2002) was considered, according to the result of Equation 1.

$$n = \frac{N \times 1/E^2}{N + 1/E^2} \quad (1)$$

Considering **E** as the tolerable sample error (10%), **N** as the research universe (11) and **n** as the minimum sample size, we have:

$$n = \frac{11 \times 1/(0,1)^2}{11 + 1/(0,1)^2} \approx 9,9$$

Therefore, since the achieved sample was greater than 9 (approximately 10 responses), for a 95% confidence level and 10% error margin, it is considered valid and reliable (GIL, 2010).

In order to verify the clarity of the questions and to assure the reliability of the data collected, the initial questionnaire was submitted to a pre-test.

According to Lakatos and Marconi (2003), a pre-test measuring 5 to 10% of the value of the sample is enough to verify to what extent the tool for data collection is able to guarantee error-free results. In this stage, it was previously answered by two AH-2 Sabre instructors, with experience in the accomplishment of Attack Action with this aircraft, but not belonging to the current 2nd/8th GAV. In this way, it was possible to check its readability and correct possible inconsistencies.

Online questionnaires, created on the Survey Monkey platform, were used for collecting data and sent by link and email to the selected experts. Such an option allowed access for the respondents (allowing filling out even by the cell phone), thus providing a faster response than traditional methods.

In a first round, each of the experts answered open-ended questions, which listed the knowledge, skills and attitudes deemed essential for the pilot who will perform the Attack Action with the AH-2 Sabre without knowing the answers of the others. Subsequently, repetitions and similarities were eliminated, resulting in three reduced lists that formed three competence matrices, by type (KSA).

In the second round, each expert received the competence matrices defined in the first round, consisting of 16 knowledge, 19 skills and 31 attitudes, and answered whether or not to agree with each of the listed KSAs. With the answers of all experts, the validation of each competence was obtained from a Coefficient of agreement, as represented in Equation 2 (SANTOS, 2001).

$$Cc = (1 - Vn/Vt) \times 100 \quad (2)$$

Where,

Cc = Coefficient of Agreement expressed as a percentage.

Vn = Number of experts in disagreement with the predominant criteria.

Vt = Total number of experts.

Santos (2001) considers acceptable as a consensus among the experts Coefficients of Agreement greater or equal to 60% ($Cc \geq 60\%$). Thus, skills with Cc less than 60% were excluded due to the low level of agreement or little consensus. After this processing, there were 15 knowledge, 17 skills and 20 attitudes (detailed

in the topic Application of the Delphi Method). The combination of these three dimensions, according to the theoretical framework observed in this survey, allowed to verify the necessary competences of the pilot who will perform the AH-2 Sabre Attack Action, answering to the first Guiding Question (GQ1) and, consequently, first Specific Objective (SO1).

In order to answer to the second Guiding Question (GQ2) and thus to reach the second Specific Objective (SO2), the competences developed in the CEOAR were identified based on the documental analysis of the Minimum Curriculum and Instruction Orders of the CEOAR, since these are documents that govern the course, as described in the theoretical framework.

Finally, based on the theoretical framework of this article and with the purpose of reaching the general objective, the competences identified in the documental survey of the CEOAR were compared with those defined in the survey of the opinions of the group of experts defined in this study.

From the analysis of the data, the answer for the research problem was found and the general proposed objective was elucidated.

## 4 DATA ANALYSIS

In the following topics, the data obtained in the application of the methodology are analyzed, in order to achieve the objectives and the answers to the questions proposed in this article.

### 4.1 Application of the Delphi Method

After the first round of questionnaires, according to the application of the Delphi Method (SANTOS, 2001), all the skills enumerated by the experts were listed, eliminating the repetitions and similarities. The result was three relations divided into 16 Knowledge, 19 Skills and 31 Attitudes (KSA). Thus, the Competence Matrices Defined by the Experts were built.

In the second round, each of the experts marked whether they agreed or not with the KSAs obtained in the first round. Thus, by applying the Coefficient of Agreement defined by Santos (2001), the items with agreement less than 60% were eliminated. In this way, the Matrices of Verified Competences with Agreement Level were built, according to Tables 1, 2 and 3.

**Table 1** – Matrix of Verified Knowledge with Agreement Level.

| | Knowledge |
|---|---|
| C1 | Know and respect the limits and capabilities of the aircraft. |
| C2 | Know the safety procedures of the aircraft and weaponry. |
| C3 | Know the procedures of Crew Resources Management (CRM). |
| C4 | Know the Attack Mission (doctrine and influence factors). |
| C5 | Know the relevant legislation, standard phraseology and code words (Federal Constitution and Aerospace Defense System Operational Standards (NOSDA)). |
| C6 | Know the methods used in tactical formations. |
| C7 | Know the several forms of tactical navigation (Low-Altitude Navigation (LAN), Navigation Between Obstacles (NBO), etc.). |
| C8 | Know the flight techniques with Night Vision Goggles. |
| C9 | Know techniques of use of air-to-ground weaponry. |
| C10 | Know techniques of use of air-to-air weaponry. |
| C11 | Know the combat maneuvers. |
| C12 | Know the operation environment and threats (scenario, enemy capabilities, etc.). |
| C13 | Know objective details. |
| C14 | Know the escort procedures. |
| C15 | Know the doctrine of use in package. |

**Source**: The Author.

**Table 2** – Matrix of Verified Skills with Agreement Level.

| | Skills |
|---|---|
| H1 | Plan missions in the Air Missions Planning System (PMA). |
| H2 | Operate the PMA system as a form of deconflict in package missions. |
| H3 | Plan missions on the Armspod (AH-2 Mission Planning System). |
| H4 | Reason with time, sun, moon and meteorology. |
| H5 | Operate the aircraft on day and night basic flight. |
| H6 | Manage the several aircraft systems. |
| H7 | Operate the helicopter on the attack mission. |
| H8 | Operate the aircraft in a formation flying. |
| H9 | Operate the aircraft at low altitude (LAN), using concealment techniques in the field. |
| H10 | Operate the aircraft's weaponry system. |
| H11 | Be proficient in all forms of use of the vector under operation. |
| H12 | Fly in wing and coordinate armed use simultaneously. |
| H13 | Know how to coordinate an adverse situation. |
| H14 | Combat ground and air threats. |
| H15 | Support the wingman. |
| H16 | Maneuver the aircraft at the boundary of its operational envelope, gaining advantage over the enemy. |
| H17 | Fly with Night Vision Goggles. |

**Source**: The Author.

**Table 3** – Matrix of Verified Attitudes with Agreement Level

| | Attitudes |
|---|---|
| A1 | Identify with the attack mission. |
| A2 | Have dedication in the preparation of the mission. |
| A3 | Quantify and qualify the mission risks. |
| A4 | Control the execution of in-flight planning. |
| A5 | Work in team with all the equipment. |
| A6 | Be aware of threats. |
| A7 | Be able to interpret an adverse situation, taking advantage of the enemy's weakness. |
| A8 | Have creativity for the development of techniques and tactics. |
| A9 | Seek excellence in the use of airborne weaponry. |
| A10 | Have the courage to accomplish the mission. |
| A11 | Interest in the constant study of the enemy. |
| A12 | Collaborate with the improvement of the group. |
| A13 | Be willing to perform exhaustive trainings. |
| A14 | Have concentration for the flight. |
| A15 | Have initiative. |
| A16 | Have a high emotional stability. |
| A17 | Be aware of own limitations/restrictions. |
| A18 | Give the utmost. |
| A19 | Have serenity for making (perhaps hard) decisions. |
| A20 | Have high adaptability capacity. |

**Source**: The Author.

Based on Rabaglio's (2001) concepts of competence formation, it is concluded that the sum of knowledge, skills and attitudes, listed in Tables 1, 2 and 3, summarizes the competences needed by the pilot who will perform the Attack Action with the AH-2 Sabre. Thus, the first Guiding Question (GQ1) is answered and the first Specific Objective (SO1) of this article is achieved.

### 4.2 Documental analysis

Following processes and the principles defended by Sacristán (2000), according to which the curriculum embraces the content necessary to develop the knowledge, skills and attitudes appropriate to the final objective of an institution, a documental research of the Minimum Curriculum and Order of Instruction of the CEOAR was carried out in order to identify the competences developed in the Course. These competences enable us to achieve the second Specific Objective (SO2), as well as to answer the second Guiding Question (GQ2) of this work.

### 4.3 Comparison of results

With the competences required for the pilot who will accomplish with the AH-2 Sabre Attack Action (Delphi Method) and the competences developed in the CEOAR (documental research), a relationship between them could be found, according to Table 4.

**Table 4** – Identification of coinciding competences. (to be continued)

| CODE - NOMENCLATURE | | KNOWLEDGE | SKILLS | ATTITUDES |
|---|---|---|---|---|
| CEOAR MINIMUM CURRICULUM | H-50 Technical Instruction. | C1, C2 | H6 | - |
| | Daytime adaptation phase class. | - | H5 | - |
| | Preparation of the daytime adaptation phase. | - | H5 | - |
| | Crew Resources Management (CRM). | C3 | H13 | A5, A6, A12, A15, A16, A19 |
| | Nighttime adaptation phase class. | - | H5 | - |
| | Preparation of the nighttime adaptation phase. | - | H5 | - |
| | Tactical graduation phase class. | C6 | H15 | - |
| | Preparation of the tactical graduation phase. | C6 | H15 | - |
| | Navigation phase class. | C7 | - | - |
| | Preparation of the low altitude navigation (LAN) phase. | C7 | - | - |
| | Navigation between obstacles (NBO) phase class. | C7 | H9 | - |
| | Preparation of the navigation between obstacles (NBO) phase. | C7 | H9 | - |
| | Geometry of Use. | C9, C10 | - | A9 |
| | Attack phase class. | C4, C5 | H4, H14 | A1, A3 |
| | Preparation of the attack phase. | C4, C5 | H4, H14 | - |
| | Escort phase class. | C14 | - | - |
| | Preparation of the escort phase. | C14 | - | - |
| | Helibrás axial weaponry system. | C2 | H10 | - |
| | Preparation of the ground shooting phase. | C2, C9 | H10, H11, H14 | A9 |
| | Preparation of the rocket launch phase. | C2, C9 | H10, H11, H14 | A9 |
| | Instruction of Helicopter Use in Combat. | C5, C8, C9, C 10, C11, C12, C13, C15 | H11, H14, H16, H17 | A6, A7, A8, A9, A11 |
| | Physiological Stage and NVG Instruction. | C8 | H17 | A17 |
| | Instructions for Use of the PMA II. | - | H1 | - |
| | Visual Perception of Objectives (VPO). | C12, C13 | - | A11 |

(conclusion)

| | | | | |
|---|---|---|---|---|
| ORDER OF INSTRUCTION | Daytime adaptation. | - | H5 | - |
| | Night adaptation. | - | H5 | - |
| | Tactical graduation. | - | H8, H15 | - |
| | Low-Altitude Navigation (LAN). | C7 | - | A4 |
| | Navigation Between Obstacles (NBO). | C7 | H9 | A4 |
| | Shallow ground shot. | C2, C9 | H10, H11, H14 | A9 |
| | Hovering ground shot. | C2, C9 | H10, H11, H14 | A9 |
| | Rocket launch. | C2, C9 | H10, H11, H14 | A9 |
| | Attack. | C4 | H7, H14 | A1, A4, A13 |
| | Escort. | C14 | - | A4, A13 |
| | Adaptation on flight. | - | - | A2, A20 |
| | Theorical knowledge. | C1, C2 | - | A2 |
| | *Briefing with the crew.* | - | - | A5 |
| | Interest in instruction. | - | - | A14, A18 |
| | Initiative. | - | - | A15 |
| | Mission preparation. | - | - | A2, A3, A4, A18 |

**Source**: The Author.

4.3.1 Knowledge

Based on the observation of Tables 4 and 5, it can be verified that all the knowledge listed by the experts as needed by the pilot who will perform the Attack Action with the AH-2 Sabre is somehow worked out during the CEOAR. Regarding knowledge related to the mastery of the aircraft and weaponry capabilities and limitations (C1 and C2), although specific to each helicopter, it is considered that the methods for such a study and its understanding are developed, as well as appreciating its understanding, in order to facilitate the execution of these precepts in future aircrafts. Therefore, it was possible to verify that the Curriculum and Order of Instruction of the CEOAR meet 100% of the knowledge necessary for the pilot who will perform the Attack Action with the AH-2.

**Table 5** – Knowledge Correlation.

| Necessary knowledge of the pilot who will perform the Attack Action with the AH-2 Sabre | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Is it developed in the CEOAR? | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 |
| | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | C9 | C10 | C11 | C12 | C13 | C14 | C15 | – |
| | Yes | Yes | Yes | Yes | Yes | Yes | Yes | – |

**Source**: The Author.

**Table 6** – Skills Correlation.

| Skills required for the pilot who will perform the Attack Action with the AH-2 Sabre | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Is it developed in the CEOAR? | H1 | H2 | H3 | H4 | H5 | H6 | H7 | H8 | H9 |
| | Yes | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| | H10 | H11 | H12 | H13 | H14 | H15 | H16 | H17 | – |
| | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | – |

**Source**: The Author.

### 4.3.2 Skills

With the analysis of Tables 4 and 6, it can be verified that the CEOAR develops 14 of the 17 skills judged by experts as necessary for the pilot who will perform the Attack Action with AH-2. In other words, the CEOAR meets 82% of the skills required to perform the concerned task.

Regarding the abilities not directly related, the following exceptions are allowed:

H2 - Operate the PMA system as a form of deconflict in package missions. The CEOAR trainees have already been instructed (in theory and practice) on the use of the Air Missions Planning System (PMA) regarding the creation of navigation routes. Thus, for the development of the H2 ability, it is suggested that such a guideline must be included in the timing of the course. Considering that the Instruction of Use of Combat Helicopter already deals with packaged missions, it should also be a good time to present this important PMA software tool.

H3 - Plan missions on the Armspod (AH-2 Mission Planning System). Knowing that, at the FAB, Armspod is an exclusive AH-2 mission planning system, there is no need to work such skill in the CEOAR. There is no harm in developing it when the pilots enter the 2nd/8th GAV.

H12 - Fly in wing and coordinate armed use simultaneously. Trainees perform a simulation of armed use during tactical formation flights. Thus, two possibilities arise for the development of this ability: to make such a simulation closer to the real one, with all the necessary procedures for the preparation of the weaponry system and the techniques of usage, or to include in the ground shooting campaign one or more real usage wing flight trainings.

### 4.3.3 Attitudes

Regarding attitudes, it can be verified that the CEOAR meets 19 of the 20 listed by experts as necessary for the pilot who will perform the Attack Action with the AH-2 Sabre, a value that represents 95% of the total.

It should be noted that the only not directly related attitude (A10 - having the courage to carry out the mission) is undoubtedly developed, both by the airborne activity and by the military profession itself.

## 4.4 Synthesis of data analysis

Under the concepts argued by Perrenoud (1999), according to which competence is the ability to act effectively in a given situation and goes beyond simple knowledge, and by Rabaglio (2001), to the point that divides competence into three dimensions: knowledge, abilities and attitudes (KSA), this article listed the skills needed for the pilot to perform the Attack Action with the AH-2 Sabre, raised through expert opinions and the application of the Delphi Method, and the competences developed in the CEOAR , extracted by documental research.

When comparing these data, veryfing the CEOAR meets 100% of the knowledge, 82% of the skills and 95% of the attitudes pointed out by the experts, the answer was obtained to the research problem and met the general objective of the research.

It is worth mentioning that, due to the vast content worked in the CEOAR, in order to meet the needs of all FAB Rotary Wings Squadrons, many of the knowledge, skills and attitudes addressed in this research are worked in a partial and incipient way, despite sufficient to meet the objective proposed by the course and give a good idea to the trainee of the capabilities of the helicopters and the Air Force Actions developed in the Air Units to which they can be moved, besides certainly facilitating future improvement.

However, as Sacristán (2000) points out, it is important to constantly analyze the curricular content of the course in order to ensure that it remains effective for the development of the competences required for FAB helicopter pilots, especially considering the continuous technological evolution, which requires the permanent updating of use techniques and tactics of the Force.

## 5 CONCLUSION

This article was developed with the objective of answering to what extent the curricular content of the Operational Specialization Course in Rotary Wing Aviation (CEOAR) develops the necessary skills for the pilot who will perform the Attack Action with the AH-2 Sabre. To answer this question and, consequently, to meet the general

**Table 7** – Attitudes Correlation.

| | Attitudes required for the pilot who will perform the Attack Action with the AH-2 Sabre | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Is it developed in the CEOAR? | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | A9 | A10 |
| | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No |
| | A11 | A12 | A13 | A14 | A15 | A16 | A17 | A18 | A19 | A20 |
| | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

**Source**: The Author.

objective of the article, two guiding questions and two specific objectives were proposed.

In search of definitions that would support the concepts that would be worked on, a theoretical framework was established, aligned with the central ideas of the work and elucidative regarding the identification of competences, construction and curricular analysis.

Then a methodology was defined to be applied for answering the questions and meeting the proposed objectives: a survey, using the Delphi Method or Experts Method; and documental research, from which the curriculum and the Order of Instruction of the CEOAR were analyzed.

In order to answer to the first Guiding Question (GQ1) and to achieve the first Specific Objective (SO1), experts were asked which competences are necessary for the pilot who will perform the AH-2 Sabre Attack Action. This process occurred with the application of the Delphi Method, based on the opinion of 10 experts. After two rounds of questionnaires, a resulting set encompassing 15 knowledge, 17 skills and 20 attitudes considered essential for the concerning task was found.

In order to answer the second Guiding Question (GQ2) and meet the second Specific Objective (SO2), the competences developed in the CEOAR were extracted by the analysis of the ICA 37-551 - Minimum Curriculum of the Operational Specialization Course in Rotary Wing Aviation and its Order of Instruction.

In the next step, the comparison of the competences highlighted by experts with those developed in the CEOAR allowed the General Objective of this research to be achieved and answered the question that motivated it, by concluding that the curricular content of the CEOAR develops 100% of the knowledge, 82% of the skills, and 95% of the attitudes that are required for a pilot to perform an AH-2 Sabre Attack Action, although superficially in some cases.

Thus, it remained clear that the CEOAR is efficient regarding the development of the necessary skills for the pilot who will perform the Attack Action with the AH-2 Sabre.

Considering the ideas defended by Sacristán (2000), it is concluded that the analysis of the curricular content of the CEOAR is fundamental to FAB for promoting the constant improvement of the curriculum as a flexible and dynamic instrument and keeping it able to remain well-structured in this way, training helicopter pilots to be well prepared for the performance of their duties.

This research does not end hereby, since it allows a starting point for future inquiries.

In view of the complexity of issues addressed in the CEOAR, it is suggested that the effectiveness of its curriculum content be checked for compliance with other important Air Force Actions and (or) for attendance to the Rotary Wing Squadrons that will receive graduated trainees. Thus, there will be constant collaboration for the improvement of the competences developed in the course and the consequent increase in its effectiveness, corroborating for the formation of pilots increasingly well prepared for the accomplishment of the missions of interest of the FAB.

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