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## **MAIN COMPONENTS OF THE PEDAGOGICAL SYSTEM OF GROUND-BASED TRAINING FOR COMBAT FLIGHTS OF FUTURE PILOTS OF TACTICAL AVIATION**

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**Brief introduction.** The main goal of the educational process in a flying higher military educational institution is the formation of high professional skills and a creative approach to solving combat missions among graduates. The nature of the actions of the crews and tactical aviation units in modern conditions of performing combat missions requires military pilots to have a high level of professional intelligence, operational-tactical thinking, and the ability to navigate correctly in a rapidly changing air tactical situation. The implementation of these requirements is ensured by training (the formation of knowledge and skills), the development of professionally essential qualities, psychological training, as well as the use of appropriate forms, methods and techniques of training of future military pilots of tactical aviation to perform combat missions. It is this aspect that requires the improvement of traditional forms and methods of air tactical training in the educational process, as well as the search and implementation of new ones.

**Keywords:** *future pilots of tactical aviation, combat flight, combat flight training, theoretical training, simulator training, psychological training, consistency of training.*

**Formulation of the Problem.** The beginning of an active discussion of combat experience and the development of requirements for a military pilot as an air combatant is associated with the widespread use of aviation in the First World War. For one, an outstanding military pilot, one of the founders of fighter aviation tactics, son of the Ukrainian land Evgraf Mykolaiovich Kruten, along with the development of theoretical bases for tactical use of fighter aircraft, indicated the need of such qualities as combat activity, initiative and striving for offensive actions for a combat pilot. [5, p. 73].

Therefore, combat flight readiness is a systemic category, which reflects pilots' high level of skill in the use of a combat aviation complex, where dominates the harmonious combination of psychophysiological capabilities with the processes of high-grade training and effective execution of combat flights and a combat aviation complex aimed at increasing combat effectiveness.

A high level of combat flight readiness is achieved over a long period of time and is based on the performance of regular training flights, a deep understanding of the art of training and application of a combat aviation complex in the process of solving a wide range of operational and tactical tasks in the dynamics of a combat flight. The effectiveness of the pilot's combat activity is ensured by solving a range of problems related not only to the preparation and organization of combat operations and tactical situations but also to the pilot's psychophysiological capabilities, stability of motivation to perform combat tasks and gain a victory, availability of combat qualities which provide aggressive engagement and retaining tactical superiority in a combat flight, overcoming a risk factor, combat (neuro-psychic) stress, tiredness and overfatigue in combat flights.

**A short analysis of current researches and publications related to the problem.** Modern scientific approaches address the problems of ground-based training of future military pilots mainly through the prism of ensuring the reliability of the human factor in the process of flight training. For example, P. Kovalenko developed a methodology for teaching spatial orientation, in which the main provisions of the theory of the phased formation of mental actions developed by P. Halperin were used. The training on the ground to perform aerobatics based on the pivot point method was carried out by the team of authors, which included V. Ponomarenko, S. Aleshin, A. Vorona, D. Gander, M. Kremen, N. Kryukov. The research teams that developed the methods of computer training were headed by Yu. Kukushkin and V. Usov [1, p. 60-100].

The existing methodological basis of the theoretical provisions of ground training of future pilots of tactical aviation includes the concept of the image of flight (N. Zavalova, B. Lomov, V. Ponomarenko); the concept of an active operator (V. Popov, V. Lapa, Yu. Dobrolensky); the concept of concurrent activities (F. Grobov, E. Derevyanko, V. Dudnikov, Yu. Demyanenko, T. Dzhamagarov, G. Beregovoi, V. Marishchuk); the concept of simulator training (K. Platonov, G. Beregovoi, E. Kozlovsky, N. Zatsarsky);

the concept of personal and human factors (S. Gellerstein, A. Shishov, A. Pikovsky, V. Tuvaev); the concept of flying skills (K. Platonov, V. Bodrov, V. Zorile, P. Shalimov); the concept of the educational environment (V. Ponomarenko, D. Gander, A. Crow); personality-oriented approach (V. Ponomarenko, L. Kochneva) [1, pp. 12-23].

Theoretical and methodological foundations of ensuring the quality of professional training of cadets of flying schools were developed by T. Plachinda, R. Makarov [2, 4].

**Aim of the publication.** Based on the existing methodological, theoretical principles of training military pilots, to determine and substantiate the main components of the pedagogical system of ground-based combat training for future pilots of tactical aviation.

**Research novelty.** For the first time, an attempt has been made to reveal the structure of the pedagogical system of ground-based combat training for future pilots of tactical aviation.

**Presentation of the research.** Considering ground-based training for combat flights of future pilots of tactical aviation a pedagogical system, it is possible to identify the following components, which are separate subsystems: psychological and pedagogical (future pilot → content (forms, methods) of ground-based training for combat flights → technical means of ground-based training); technical and ergonomic (future pilot → combat aviation complex); tactical (future pilot → the art of training and performing combat flights); psychological (future pilot → combat psychological qualities → psychological readiness for combat flights while countering a strong opponent).

That is, the problem of training future pilots of tactical aviation for combat flights is the solution to a complex task, which must take into account the dynamics of combat activity of the pilot in the process of preparation and execution of various types of combat flights, which is a systemic factor in the subsystems defined above. With this approach, a complete understanding of ground-based training for combat flights is possible as a complex, systemic ground pedagogical (educational) process and provides the greatest logic and consistency in achieving a high level of combat prowess for future pilots of tactical aviation.

Taking into account the tasks of ground-based training for combat flights, determined by the specifics of combat activity of the pilot of tactical aviation, it is possible to formulate the pedagogical essence of ground-based training for combat flights, which is understood as an integrative pedagogical process, during which the fighting efficiency and morale and intellectual tactical qualities are formed. These determine to perform successful flights, body resistance to extreme factors of combat flights, high level of performance capabilities in combat conditions. Therefore, specialists in different types of training should be involved in solving ground-based training tasks for combat flights: theoretical, simulator-training, physical, psychological, search and rescue, etc.

That is, the pedagogical process of ground-based training for combat flights should be integrative, due to the complex of ground training tools used to solve practical problems of training for combat flights on the ground. This fact makes one think about

the pedagogical system of ground-based training for combat flights from new methodological positions that take into account the structure of the ground organization of the pedagogical process based on the regularities of formation of readiness for combat activity in the air with intensive influence of partial ground pedagogical processes forming an air combatant's qualities which are diverse in nature and essence.

Thus, the pedagogical system of ground-based training for combat flights should include the goals and objectives of such training, its content, principles of scientific organization of integrative pedagogical processes, specific didactic principles, methods of formation of combat qualities and evaluation of their level. It is advisable to assign a special place in it to the definition of interdisciplinary relationships and optimization of the educational process.

Since the issues of integration of pedagogical processes of ground-based training of future pilots of tactical aviation for combat flights have not been considered in the research works, it is advisable to define and specify the interaction and interrelation of different components of ground-based training of future pilots of tactical aviation involved in the functioning of the pedagogical system of ground-based training for combat flights.

The pedagogical system of ground-based training for combat flights, as mentioned above, consists of a large number of elements where the training aids and their sub-elements are separate academic subjects. The interaction between the training methods and individual subjects does not take place entirely but selectively taking into account the types and stages of preparation and execution of combat flights and the period of training under consideration.

Therefore, the structure of the pedagogical system of ground-based training for combat flights can be understood as a special purposeful space-time integration of elements of the educational process to obtain a given result by the system, i. e. the formation of combat qualities of a future pilot of tactical aviation.

The characteristic feature of the pedagogical system of ground-based training for combat flights (ground-based combat training) of future pilots of tactical aviation should be the organic interconnection of all its elements, which ensures the change of the whole system when the conditions of combat use of units of tactical aviation change.

Such an integrative link between the means of pedagogical influence in the organization of a pedagogical system of ground-based training for combat flights subordinates their functioning to a single purpose - the purpose of training a highly effective pilot of tactical aviation.

The organization of the pedagogical process of ground-based training for combat flights is impossible without the integrative ordering of other ground subsystems and training aids, without optimization of all ground components of the educational process. That is, the organization of the pedagogical process of ground-based training is a totality of elements, intersubject relationships and relationships with other ground pedagogical

systems of the educational process for the benefit of integrated training for combat flights of future pilots of tactical aviation.

The development and operation of a pedagogical system of ground-based training for combat flights, as a specific methodology of research, provides an integrative understanding of the laws of obtaining a single result of ground-based training for combat flights (ground-based combat training) of future pilots of tactical aviation, which focuses the results of partial pedagogical processes. Therefore, ground-based training for combat flights is a section (area) of professional pedagogy that studies the specific manifestation of the regularities of ground-based training to perform combat missions in the air for future pilots.

Due to the fact that pedagogical assistance of ground-based training of future pilots of tactical aviation for combat flights has not yet become a reality, but this process has a pedagogical category, it is advisable to form an educational environment for ground-based training for combat flights. Special aspects of ground-based training to perform combat flights reveal the need to take into account different types of flight activity while preparing and performing combat flights as well as combat capabilities of aviation equipment and conditions of combat use of aviation.

In order to transmit various educational, teaching and training information in the ground-based training process for combat flights, the following methods of pedagogical influence can be applied: *visual* (using different techniques and forms of displaying sighting information, tactical techniques and combat manoeuvres); *reproductive* (verbally presenting material on the combat application of aircraft and tactics of the aviation branch and its visual presentation in the course of group exercises and simulator training); *problem-search* (used in the process of group exercises, course work, training); based on software algorithms (used in the process of acquiring knowledge on the work with arms control, group exercises and simulator training).

Reproductive methods are used in the transfer of theoretical knowledge of tactics of a branch of aviation and the subjects that provide it. Such knowledge is needed as a basis for developing the search and creative skills to develop tactical techniques and combat manoeuvres.

Problem-search methods provide an opportunity for the development of professional intelligence in preparing and performing combat missions and intensification of cognitive activity.

These methods include describing a problematic air tactical situation (scenario), explaining its essence, and motivating to find its own solution. If the situation is solved successfully, it can be practised on an aviation simulator using the following complications [2]:

- reducing the time to prepare and complete the task;
- reducing the amount of required air-tactical situation;
- inclusion of additional input data, limitation of ways of finding the solution;
- creation of a complex of problematic air-tactical situations.

Problem-search methods of the educational process during ground-based training for combat flights include:

- creative nature of the decisions, but taking into account rigid algorithms (complying with the order of preparation for the execution of combat missions and requirements of flight safety);
- alternativeness to the conditions of performing combat missions and conclusions based on the evaluation of the situation (with compliance with flight safety requirements);
- possible variability of decisions in the dynamics of combat flight execution;
- the need for causal analysis of air-tactical situations in the dynamics of their development;
- development, testing and correction of new (optimal combinations of known ones) tactical techniques and combat manoeuvres;
- essential connection with a certain practical action;
- methods related to mental activity and physical fitness.

Physical training methods during ground-based training for combat flights are used as a continuous process and provide improvements and adjustments to the endurance of regular overloads, the development of distribution and switching of attention, increased coordination of movements, etc.

Hand-to-hand combat and preparation for survival in conditions of autonomous existence improve emotional-volitional stability and provide training for future pilots of tactical aviation in the event of catapulting over enemy territory.

The formation of professional and tactical thinking has top priority when teaching the order of preparation and execution of combat flights.

At the tactical level it is:

- choosing a method and developing a combat flight plan;
- rapid optimization of the plan in a combat flight in case the air-tactical situation changes;
- the focus of consciousness on the complex of pilotage-navigation, sight-tactical and out-of-window air-tactical information;
- the processes of making an advance, relative to the enemy, tactical decisions alone and when managing a pair (group) in the conditions of rapid change of air-tactical situation;
- the ability to consciously perform joint actions;
- maintaining a permanent visualization of the spatial attitude relative to the air (ground) targets, the position of the air (ground) enemy, the line of engagement.

This determines the priority of the formation of the intellectual component in the process of ground-based training for combat flights of future pilots of tactical aviation. Therefore, technical teaching aids must ensure the development of the tactical component of the professional intelligence of future pilots of tactical aviation as a leading component of combat activity, which is the most "vulnerable" in combat conditions and whose formation is the most difficult.

Technical teaching aids in the process of ground-based training for combat flights of future pilots of tactical aviation is advisable to use for the formation of such skills [3, p. 265]:

- maintaining spatial orientation with an intensive change of ways of formation of spatial visualizations depending on the type of spatial positions - navigation-piloting or air-tactical and use of an instrument or non-instrument sources of information;

- jointness of actions in the piloting and appearance of one or more other tasks: spatial awareness, work with arms controls, search for a target, making tactical decisions, controlling the wingman (group);

- rapid assessment of the current air tactical situation and making tactical decisions in combat flights in conditions of alternative situations and inaccuracy, incompleteness and contradictory nature of tactical air information;

- fire and tactical interaction in pairs (within a group).

As an experience of the organization and implementation of the educational process of future military pilots shows, the way of solving the listed tasks can be achieved by consistent preparation of the trainees on the ground. Such training consists of the process of acquiring necessary mental mechanisms of combat activity in the air by ways and means appropriate to this process.

The first level of ground-based training (ground combat training) consists of theoretical training for combat flights (level of verbal-logical tactical training) and practical training on the formation of resistance to the effects of harmful factors of combat flights. At this level, future pilots of tactical aviation acquire knowledge in the combat use of aircraft, combat manoeuvring, navigational training, tactics of a branch of aviation, tactical medicine and survival in the conditions of autonomous existence on the territory of the enemy. Practical training on formation of resistance to the influence of harmful factors of combat flights consists of special physical training of formation of resistance to the influence of large and long overloads, a course of practical survival in the conditions of autonomous existence on the territory of the enemy, a course of practical, tactical medicine and training in hand-to-hand fighting. Practical training on the formation of resistance to the influence of harmful factors of combat flights is carried out in parallel to and during all levels of ground training for combat flights [3, p. 264-266].

The first level of ground-based combat training (CFT) will certainly be accompanied by the intensification of other mental cognitive processes. Training of short-term and long-term memory is in progress. For this purpose, verbal methods are used: an oral test of knowledge in tactics of a branch of aviation and tactics of actions in different conditions. Elements of dynamics of development of air-tactical situations should be included in the training. This is ensured by the use of computer programs DCS (digital combat simulator), which allow you to work with sighting and instrument information, fragments of visual air-tactical environment, to work out issues of fire and tactical interaction in pairs (within a group).

At the second level, (visual and image tactical actions) of ground-based training the basis of possible tactical actions, visual representations of spatial tactical (tactically disadvantageous, tactically advantageous, tactically equal) positions relative to the ground or air enemy positions are formed, as well as such professionally important intellectual qualities as the development of operational-tactical thinking and foresight of the development of air-tactical situations.

At the second level of training for combat flights a psychological practicum is conducted to perform the following basic tasks: low-altitude and ultra-low altitude flights, combat use against ground-based targets, combat use against aerial targets and ground-based search for small-scale targets.

We use DCS computer programs with fragments of the dynamics of combat flight stages, aids for displaying sighting information, and controls of the procedural simulator armament, which allows you to make and implement a mental tactical decision. As actuating information, it is possible to use not only instrument information but also a time factor. To do this, a pre-prepared piece of sighting and tactical air information is displayed on the indicators for a while. The task is to anticipate the development of an air tactical situation and take appropriate actions. The use of sighting and air-tactical information and controls of the procedural simulator armament allows forming operational-tactical thinking. The formation of operational-tactical thinking provides the processing of incomplete and contradictory air-tactical information in combat operations. It is implemented in the process of changing the plan of a combat flight in the air in the event of unforeseen air-tactical (ground) situation. In order to improve tactical thinking at the second level, it is necessary to create problematic and conflicting situations in the course of computer and training exercises as well as to simulate the use of enemy electronic warfare and misleading (hidden) actions, to limit the pilotage-navigation and sighting information.

The essence of the third level (joint pilotage-tactical actions) of ground-based training (CFT) consists of the formation of the ability of a future tactical aviation pilot to perform actions with the armament controls and make tactical decisions without reducing the quality of piloting techniques (without violating the requirements of flight safety). At this stage, we use a complex simulator and DCS computer programs.

The fourth level (sensory-subject) of ground-based training (CFT) is conducted on a complex simulator and in the cockpit. It contributes to the formation of the ability to make and implement tactical decisions when practising in one's mind non-standard, most difficult tactical situations (provisions), especially those that cannot be practised on the simulator and in training flights. Moreover, the formation of the ability to solve a tactical situation in one's mind does not only mean to imagine motor and mental actions but also to live through emotions inherent in this situation. Thus, the essence of the fourth level lies in the psychological modelling of the modes of action and training that are learned. Therefore, the sensory-subject level of training forms the skills of psychological readiness for a specific combat flight, which provides the perception of encountering a real

opponent as a familiar situation. This eliminates the factor of an unexpected tactical situation. Training on the visualization of a specific combat flight is consolidated on a complex simulator, which, as much as possible, reproduces all the conditions and actions that have been practised in one's imagination. Also, training in the cockpit is carried out in order to form and improve a real working motor field and the ability to perform sensory-subject training without the use of a simulator, which may not be available in real combat conditions.

The fifth, final level (fire and tactical interaction) of ground-based training (CFT) is training on tactical simulators by the program, which allows you to work out all the issues of the process of preparation and execution of combat flights consistently as a part of a pair, flight, group or squadron, respectively, as a leader of the pair, flight, group or squadron. Taking into account modern didactic capabilities of tactical simulators, all training at the fifth level of the CFT is conducted in the form of tactical flight training and tactical flight exercises.

**Conclusions and prospects for further research and propositions.** The proposed approach to ground-based training for combat flights of future pilots of tactical aviation based on the theory of the image of flight provides the formation of not only the visualisation of combat flights but also the skills of independent formation of the visualisation of a specific combat flight. In this case, the formation of the image of a combat flight takes place at the appropriate mental levels – linguistic-cognitive, visual-imaginative and sensory-subject, which complies with the didactic principles of flight training.

The implementation of all five levels of CFT (except practical training in the formation of resistance to the harmful effects of combat flight factors) can be carried out in a computer class if it is equipped with the appropriate software. Therefore, the sequence of formation and improvement of air-tactical intellectual professionally important qualities of future pilots of tactical aviation can be achieved not only by the consistent change of aviation simulators but also by the use of a computer system that can realize the presented sequence of ground-based training for combat flights.

We see the prospects for further research in the development of training programs for future pilots of tactical aviation to perform combat flights.

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# ОСНОВНЫЕ СОСТАВЛЯЮЩИЕ ПЕДАГОГИЧЕСКОЙ СИСТЕМЫ НАЗЕМНОГО ОБУЧЕНИЯ БОЕВЫМ ПОЛЁТАМ БУДУЩИХ ЛЁТЧИКОВ ТАКТИЧЕСКОЙ АВИАЦИИ

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## Аннотация

**Краткое введение.** Характер действий экипажей и подразделений тактической авиации в современных условиях выполнения боевых полётов требует от военных лётчиков высокого профессионального интеллекта, оперативного тактического мышления, способности правильно ориентироваться в быстро меняющейся воздушно-тактической обстановке.

**Проблема.** Эффективность боевой деятельности лётчика обеспечивается решением комплекса проблем, связанных не только с подготовкой и ведением боевых действий, но и с психофизиологическими возможностями лётчика, стойкостью мотивации на выполнение боевых заданий, наличием боевых качеств, которые обеспечивают агрессивный захват и удержание тактического превосходства в боевом полёте.

**Краткий анализ актуальных исследований и публикаций, связанных с проблемой.** Существующую методологическую основу теоретических положений наземного обучения будущих лётчиков тактической авиации составляют: концепция образа полёта (Н. Завалова, Б. Ломов, В. Пономаренко); концепция активного оператора (В. Попов, В. Лапа, Ю. Доброленский); концепция совмещённой деятельности (Ф. Гробов, Е. Дервянко, В. Дудников, Ю. Демьяненко, Т. Джамагаров, Г. Береговой, В. Марищук); концепция тренажерного обучения (К. Платонов, Г. Береговой, Э. Козловский, Н. Зацарный); концепция личного и человеческого факторов (С. Геллерштейн, А. Шишов, А. Пиковский, В. Туваев); концепция лётных навыков (К. Платонов, В. Бодров, В. Зорилэ, П. Шалимов); концепция образовательной среды (В. Пономаренко, Д. Гандер, А. Ворона); личностно ориентированный подход (В. Пономаренко, Л. Кочнева).

Теоретические и методические основы обеспечения качества профессиональной подготовки курсантов лётных учебных заведений разработаны Т. Плачиндой, Р. Макаровым.

**Цель исследования.** На основании существующих методологических теоретических положений обучения военных лётчиков определить и обосновать основные составляющие педагогической системы наземного обучения боевым полётам будущих лётчиков тактической авиации.

**Новизна исследования.** Впервые сделана попытка раскрыть структуру педагогической системы наземного обучения боевым полётам будущих лётчиков тактической авиации.

**Ключевые слова:** будущий лётчик тактической авиации, боевой полёт, обучение боевым полётам, теоретическая подготовка, тренажёрная подготовка, психологическая подготовка, системность подготовки.

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