Innovative: International Multi-disciplinary Journal of Applied Technology
(ISSN 2995-486X) VOLUME 02 ISSUE 06, 2024

The Importance of the Application of Artificial Intelligence in the Field of Aviation

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Annotation:

In the article, development and implementation of artificial intelligence technologies in manned and unmanned aerial vehicles, the construction of intelligent aviation systems based on them is one of the most promising areas of combat aviation development, and the introduction of artificial intelligence technologies largely overcomes the above shortcomings and coverage of limitations and working with large volumes of data, high speed of information processing and autonomy of actions are discussed.

Keywords: *artificial intelligence, factors, psychophysiological stress, cognitive ability, aerobatics, intellectual system, thinking, emotion, software technology.*

Currently, the military sector is witnessing an unprecedented rate of technological development. The traditional process of gradual development and modernization of conventional weapons is replaced by the introduction of technologies that provide a sharp increase in tactical-technical characteristics and combat potential, combined with efforts aimed at quality renewal, effective use. operational interaction of these systems. Aviation is no exception.

According to leading local experts, the armed struggle in the 21st century is fundamentally different from the ways and means of conducting wars in the past. The development and implementation of artificial intelligence technologies in manned and unmanned aerial vehicles, building intelligent aviation systems based on them is one of the most promising areas of combat aviation development, which ensures a significant increase in efficiency and effectiveness

With the development of weapons and military equipment, changes in the forms and methods of conducting combat operations, as well as the emergence of wars and armed conflicts, new requirements are imposed when both classical military operations and operations of irregular armed formations are combined.

In order to achieve the goal of military operations, it is necessary not only to quickly and effectively confront the enemy in the execution of a combat mission, but also to carry out multifaceted

planning and forecasting the development of the operational-tactical situation. taking into account and analyzing a large number of factors in a very short time for the rational use of opportunities and resources. All this often happens in the absence of complete, reliable information about the enemy and under the highest psychophysiological stress. [1-2]

75-80% of all incidents in aviation (flight incidents) are related to the psycho-physiological state of a person, and the share of accidents caused by a personal factor can be from 50 to 90% of the total coefficient of accidents. Physiological costs of a pilot in flight are quite high. In fighter jets, the heart rate of many pilots rises to 120 beats per minute or more in normal level flight, and up to 160 beats per minute in supersonic and cloud-bursting. During aerobatics, there may be a short-term increase in blood pressure up to 240/150 mm Hg. In a military pilot, a test pilot, the body is constantly working under stressful conditions.

When limited flight conditions are reached, equipment failure, flight in severe conditions, ejection, changes in the cardiovascular system are accompanied by the release of steroid hormones, adrenaline, glucose, triglycerides 5-7 times higher than the physiological norm. The stress and concentration required for an hour of flight in a fighter jet is equivalent to the eight-hour workload of a ground transport driver. In the short term, man, with his naturally limited ability to process vast amounts of information and make quick decisions as a commander and operator of aviation equipment, becomes a bottleneck as most species grow. is going Complex tasks that must be solved "here and now" reduce to a minimum the psychophysiological and cognitive abilities inherited by man from nature.

At the same time, against the background of improving the technical characteristics of aircraft, the following physical limitations of a person are becoming more and more important. [3-4]

Limits on maximum overload.

A person can withstand overloads of up to 15 g for 3-5 seconds without losing consciousness. Trained pilots in anti-g suits can tolerate g-forces from -3g to +12g. With a positive overload of 7-8 g, the pilot's eyes "go black", vision disappears, and the person gradually loses consciousness. Accordingly, with such overloads, he cannot focus on the complex tasks that arise in a combat situation.

Perceptual blindness (blindness of inattention).

Neglect of any object of a purely psychological nature can also be defined as the pilot's inability to see a stimulus that suddenly appears in his field of vision. According to research, perceptual blindness occurs in any person, regardless of the presence of cognitive impairment. It cannot recognize all the stimuli offered at the same time, and as a result it has a "temporary blindness effect", when it is not possible to distinguish objects or stimuli that appear unexpectedly and are often very noticeable.

Cognitive disorders.

Thinking biases or pattern deviations resulting from dysfunctional beliefs embedded in cognitive schemas. Cognitive distortions are an evolutionarily established pattern of human behavior, whereas a machine is not subject to such distortions of reality (a combat situation).

Limits on the number of regular social contacts (Dunbar's number).

Maintaining such relations involves knowing the specific characteristics of a certain object, with which it is necessary to maintain relations, its nature, as well as its social status, which requires the use of certain mental abilities and considerable intellectual resources. According to various estimates, the number of Dunbar in human communities is in the range from 100 to 230, and is

often conventionally accepted as 150. Accordingly, in large groups, a person cannot physically store more things in memory.

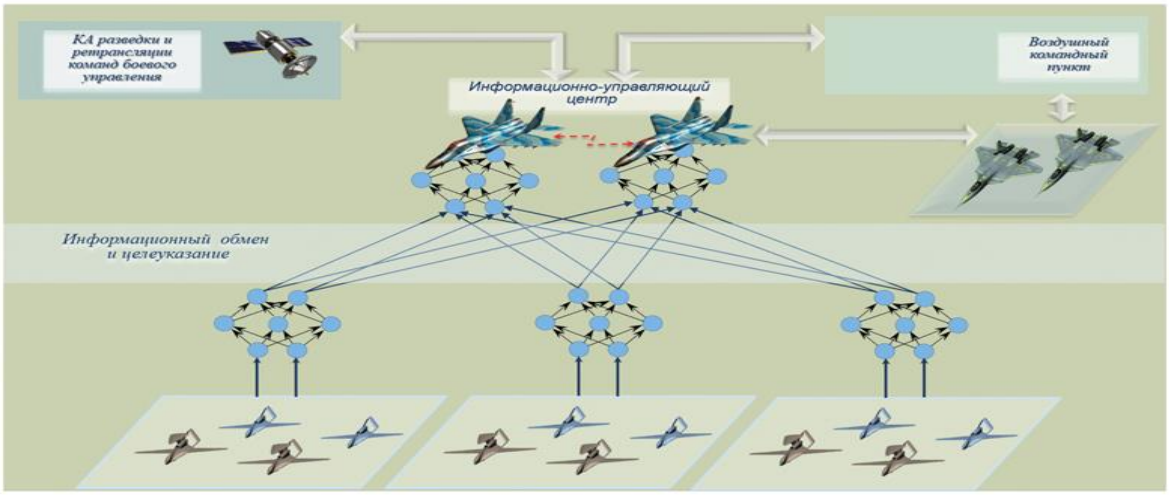
Psychological aspects of the human factor.

The psychological aspect of the human factor of technical activity belongs to its personal and social subsystem, where it represents the anthropological limitations caused by the psychological characteristics of the individual. These include:

- decreased ability to predict the development of the situation (decrease in cognitive function);
- sufficiently objective self-assessment, which leads to the adoption of decisions, the implementation of which is beyond the power of a particular person;
- insufficient professional (technological) discipline;
- Tendency to make unreasonable decisions (adventurism, unreasonable "bravery", etc.);
- decreased resistance to stress;
- Incomplete psychological compatibility in the team.

Naturally, artificial intelligence is free from the above limitations, and it surpasses human capabilities in solving the problems of identifying and recognizing objects.

The implementation of artificial intelligence technologies can largely compensate for the above shortcomings and limitations and bring three main advantages: working with large amounts of data, high speed of information processing and autonomy of actions.



From a practical point of view, the development of artificial intelligence technologies refers to the creation of intelligent machines or computer programs capable of automatically performing functions that were previously only available to humans. The main properties of technical systems belonging to the SI class are appropriate behavior, automatic problem solving, rational thinking, pattern recognition, and the ability to acquire knowledge by itself (learning by examples). Basically, the result of the development and implementation of artificial intelligence is the ability to exclude a person from the process, where a decision must be made in the shortest possible time, and the system does not have seconds to consult with a person.

On the battlefield, whoever makes quick decisions and reacts wins. Cars are unmatched here. Artificial intelligence allows to quickly and accurately identify targets without human intervention,

to issue options and scenarios for further actions, and to respond flexibly to a changing situation in real time.

Conceptually, it is possible to distinguish a number of main directions, the development of which will allow the creation of artificial intelligence systems in relation to military activities.

1. Representation of knowledge - development of methods of systematization, classification and formalization of knowledge from various problem areas (political, military, military-technical, psychological, organizational, etc.) for further development of solutions at all stages of military development.
2. Modeling of reasoning (decision-making processes) - studying and formalizing various schemes of human conclusions based on various information for conducting combat operations, creating effective programs for computer implementation of these schemes.
3. Creation of dialogue procedures for communication in natural language, which provides communication between an intelligent system and a human specialist in the process of solving problems, including in extreme situations involving danger to life, in the transmission and reception of informal orders.
4. Planning of combat operations - the development of control algorithms based on knowledge of the problem area, which are stored in an intellectual system and are constantly obtained from various and diverse data sources: reconnaissance, geodetic, topographic, meteorological, hydrographic, etc.
5. Creation of tools for learning and updating the knowledge base of intellectual systems during their activity, acquiring, collecting and generalizing skills and qualifications. [5-7]

Undoubtedly, the development and introduction of artificial intelligence methods will lead to breakthroughs in the combat potential, in the formation of the appearance of weapons, and even in the philosophy of creating and using weapon systems and military equipment.

According to the opinions of domestic and foreign experts, the further development of combat aviation systems with unmanned aerial vehicles will move from single use to group, collective actions with a high level of information impact, as well as independence, autonomization of behavior. and decision making.

The management system of such groups should have artificial intelligence and sophisticated calculation tools. The group control algorithm should determine the conditions and methods for calculating the reasonable composition of the combat group, solve the problems of situation modeling, target allocation and task effectiveness assessment.

To achieve such a result, it is necessary to create promising intelligent aviation systems and software for them, as well as "teach" them all the necessary things.

Intelligent aviation system (Intelligent Aviation System) built on the basis of unmanned aerial vehicles controlled using "artificial intelligence" technologies allows to conduct combat operations and perform multi-component tasks characterized by a high level of uncertainty. Exactly:

Reconnaissance, surveillance, search for targets;

Fire damage;

Information loss;

Transport tasks;

Organization of information and communication exchange networks, etc.

By analyzing the purpose of advanced intelligent aviation systems and the current level of technological development of artificial intelligence systems based on knowledge and machine learning, a number of key problems and tasks can be formulated and solved. creation of effective combat aviation systems.

According to current forecasts, practical functional artificial intelligence can be created by 2024-2027. It will not be thinking and feeling (so-called "strong" or universal SI), but software and hardware technology that can replace humans in almost any field of activity, special or functional SI). Undoubtedly, in the near future in the field of intellectualization of aviation, there will be a large-scale competition between leading countries and companies for the rapid development and introduction of artificial intelligence technologies. The main directions of artificial intelligence technologies in combat aviation systems, intelligent aviation systems and their application methods can be identified today.

Artificial intelligence has great potential for the development of military aviation. Despite the fact that the implementation of artificial intelligence is only in its early stages, great progress has already been made. Currently, all technological conditions are created for the development of intelligent aviation systems capable of bringing the entire weapon system to a new level of quality.

Thus, advanced intelligent aviation systems are the concept of the future battlefield. Advances in the application of artificial intelligence will undoubtedly provide leadership in the 21st century world in the coming years, just as the leaders of countries that mastered nuclear physics technologies did in the second half of the 20th century.

Foydalanilgan adabiyotlar:

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