

MINISTRY OF DEFENCE OF UKRAINE  
MINISTRY OF EDUCATION AND  
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Central Research Institute of Arms of the Armed Forces of Ukraine

COORDINATION PROBLEMS OF MILITARY TECHNICAL AND  
DEFENSIVE INDUSTRIAL POLICY IN UKRAINE. WEAPONS AND  
MILITARY EQUIPMENT DEVELOPMENT PERSPECTIVES

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duration of their operation, and d) in general, increasing the safety and operation life of structures and objects.

The organization of PCM is possible on active (or reconstructed) chemical production using standard chemical equipment.

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## **ARTIFICIAL INTELLIGENCE AS THE BASIS OF FUTURE CONTROL NETWORKS**

The implementation of Artificial Intelligence (AI) is an important trend in the development of battlefield and weapons control systems. NATO experts use two alternative definitions of artificial intelligence (NIAG StudyGroup SG-238 “GBAD Operations against the 21st Century Peer Nation Cruise Missile and Unmanned Aerial Systems (UAS)”):

“AI is the capability provided by algorithms of selecting optimal or sub-optimal choices from a wide possibility space, in order to achieve goals by applying strategies which can include learning or adapting to the environment”;

“Artificial intelligence (AI) refers to systems designed by humans that, given a complex goal, act in the physical or digital world by perceiving their environment, interpreting the collected structured or unstructured data, reasoning on the knowledge derived from this data and deciding the best action(s) to take (according to pre-defined parameters) to achieve the given goal. AI systems can also be designed to learn to adapt their behavior by analyzing how the environment is affected by their previous actions”.

As a scientific discipline AI includes several approaches and techniques, such as:

- machine learning (deep learning and reinforcement learning),
- machine reasoning (planning, scheduling, knowledge representation and reasoning, search, and optimization),
- robotics (control, perception, sensors and actuators, as well as the integration of all other techniques into cyber-physical systems).

AI is useful in particular with respect to Human resources & manning requirements: making (heterogeneous) systems work together; data exchange; command coordination; target allocation (also between nations); working with fewer resources; taking the man on/over the loop; coordination of sensors and effectors; threat detection and identification; semi-autonomous weapon allocation; improving timeliness (fast threat, pop up, numerous threat); derivation of intent, situational awareness and evaluation.

The main applications of Artificial Intelligence and Machine Learning are to enhance C2, Communications, Sensors, Integration and Interoperability.

On the basis of Artificial Intelligence (AI) and Machine Learning (ML) with Microsoft Common Objects in Context (MS-COCO) or Limpid Armor Inc.

(Ukraine) technologies the Synthesis of Augmented Reality Symbols can be provided. It enables target acquisition, targeting of moving targets (single or swarm), coordination and deconfliction of distributed Joint Fires between networked combat vehicles, tanks, ships etc. also inside Manned and Unmanned Teams (MUM-T).

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### **ACTUALIZATION OF THE TASK OF CREATING A LIFECYCLE MANAGEMENT SYSTEM FOR ARMAMENTS AND MILITARY EQUIPMENT IN UKRAINE**

The need to create a lifecycle management system for armaments and military equipment (LCMS AME) in Ukraine is due to several factors, and, first of all, the imperfection of the existing lifecycle management system for AME. There are several aspects here. Admitting to the troops in the process of rearmament of the army and navy modern high-tech equipment should be maintained in constant readiness for its intended purpose. This is especially true when performing time-consuming, medium, major and major overhaul with modernization. These types of repair are capable of performing only organizations - manufacturers of defense-industrial complex (DIC).

Another, equally important aspect is the lifetime of the equipment. For a large part of the AME it is ten years. They may undergo several upgrades during this period. This will save considerable money on the purchase of new samples. And without serious logistical support from DIC organizations, this task is impossible.

The main disadvantages of the current LCMS AME are the following:

the main contractors for the creation, production, repair of products are responsible for the quality of work only within a separate stage of the life cycle. At the same time, the work performed at different stages of the lifecycle products remains weakly interdependent, and the overall goal of control for the entire lifecycle is not fully achieved;

there is no effective mechanism for engaging industry to perform maintenance and repair work;

the participants of the lifecycle products are not provided with complete and up-to-date information about the lifecycle, first of all, information about the actual indicators of reliability, readiness, consumption of resources, costs of the lifecycle;

continuous monitoring of the values of the tactical and technical characteristics of the products, the value costs of the lifecycle, from designing the product to its decommissioning, is not provided;