

## **AVIATION, ROCKET AND SPACE EQUIPMENT**

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### **RELAUNCH OF UKRAINIAN AEROSPACE IN COOPERATION WITH EXTENDED AUKUS AND EU PARTNERS IS VITAL FOR THE EURO-ATLANTIC SECURITY**

### **ПЕРЕЗАПУСК АЕРОКОСМІЧНОЇ ГАЛУЗІ УКРАЇНИ У СПІВПРАЦІ З РОЗШИРЕНИМ БЛОКОМ AUKUS І ПАРТНЕРАМИ З ЄС Є ЖИТТЄВО ВАЖЛИВИМ ДЛЯ ЄВРОАТЛАНТИЧНОЇ БЕЗПЕКИ**

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The full-scale invasion of Ukraine by the Russian Federation on February 24, 2022 further changes the global security system, which is the initial prerequisite for international military-technical cooperation, which is a top priority for Ukraine's technological and defence capabilities [1].

Furthermore, as since February 24, 2022 Ukraine has been intensively spending at first local and imported Soviet-made legacy military equipment, and later switching to NATO equipment, an issue of exhausting the Partners' arsenal has alarmed almost unexpectedly.

To address the issue of military equipment replenishment one of the tasks is to relaunch a domestic military industry of Ukraine. The necessity of this activity has already become clear beyond the Ukrainian professionals as there are intergovernmental negotiations being held between Ukraine and Partners [2].

Prior to fulfilment of the task there are several aspects, which have to be clearly covered with respect to lessons learned and anticipating the future risks for the national security of Ukraine and Partners. Among these aspects are: political background, technology non-proliferation and export regulations, technical areas for Ukraine to concentrate.

Considering for the global geopolitical trends the faster Ukraine begins to claim for its priority position in the new system of world's division of labour

and wealth, the better results the people of Ukraine and the state will achieve in each horizon of planning. The Policy Paper of Council on Geostrategy “‘Global Britain’ and the Black Sea region” [3] is a benchmark for Ukraine of a proactive behaviour and stipulation of its desired future state, despite the low predictability of the impact of most external factors.

The Council on Geostrategy is already considering extending the AUKUS format to JIAUKUS – Japan, India, Australia, the UK, the US. Against this background, it is natural for Ukraine to join such an intercontinental security format.

The essential task of any military industry is assuring the supply chain resilience. Among the shortages of essential construction materials and technologies in Ukraine it is absolutely critical to have an access to microelectronic and communication parts and components.

By this date microelectronics has become concentrated primarily under control of two geopolitical competitors: the USA and the PRC. To address the threat of further proliferation of high-performance computational technologies to hostile regimes the US Bureau of Industry and Security of Department of Commerce has imposed new interim restrictions on the export controls of the advanced computing items [4].

An important issue for Ukraine is to determine which classes of domestic military vehicles to focus on for the modern and perspective multi-domain battlefield.

It is not an exaggeration to state that the most critical domain of the Armed Forces of Ukraine is the Joint Missile and Air Defence System. Ukraine has a vast experience and expertise in creating and manufacturing the high-precision air-to-air, air-to-surface and surface-to-surface missile systems. Considering for the current deterioration of domestic manufacturing capacities and compromised supply chains it is of a high importance to establish long-term political-industrial partnerships with the leading Western Partners and OEMs. The benchmark of such cooperation is the Israel theatre missile defence system with Arrow/Hetz exoatmospheric hypersonic interceptor missile jointly developed and produced by Israel and the US for long-range threat engagement, as the key element of the multi-layered defence missile array [5].

The vital component of the air defence system is the area of combat aviation. Taking into account the tactical situation, especially in the electromagnetic domain, it is appropriate to focus on the creation of combat autonomous and semi-autonomous unmanned combat aerial vehicles. Despite the fact that piloted aviation will not lose its relevance in the foreseeable time horizon, but in the conditions of Ukraine, the further, the

more dangerous, given the risk of loss of pilot's life, will be the use of piloted aircraft for tactical, and later operational combat tasks.

As an emphasis, NATO military strategists expect that autonomous combat equipment will be utilized as early as 2025 [6].

The development of autonomous combat vehicles simultaneously allows solving the problem of their teaming with human formations and human-controlled equipment. Already known example in the field of unmanned combat aerial systems (UCAS) is the Boeing Loyal Wingman and the Sukhoi S-70 «Okhotnik» [7].

An example of the tactical UCAS is the ACE ONE as an aerial component of the regional air defense system, which allows delaying the use of ground air defense components in order to increase their survivability. The aircraft itself has a sustained cruising speed of above 500 kt and the power plant with an afterburner provides for high acceleration. At the same time, the aircraft is capable of carrying a significant combat load, the weight of which can reach about one ton. For example, air-to-air, air-to-surface missiles and loitering munitions [8].

Usually, the interaction of several UAVs as part of a cluster system with the distribution of functions under the general control of a human operator is considered. In the English language literature, this principle of interaction was named «collaborative autonomy». Derived from «collaborative autonomy» is the concept of «swarm» of autonomous machines interacting with each other, with such a quantitative advantage that the enemy's attack and defense systems will not be able to hit a part of the «swarm» that is critical for the performance of a combat mission.

In the future, manned aviation will increasingly focus on solving operational and strategic tasks, for example, supersonic interception and tracking of targets by high-speed heavily armed airplanes, taking the F-15EX as a reference, in interaction with its own fleet of UAVs. With a view to support the capability of manned combat aviation, it is attractive for Ukraine to obtain regional specialization in the field of combat pilots training for the «5th» (F-35) and «4.5th» (F-15EX, etc.) generations of airplanes for its own Air Force and for the neighbouring countries, since Ukraine has already been offered to establish manufacturing of the brand new Boeing T-7A multifunctional airplane, which was created to ensure interoperability in the NATO terminology [9].

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## **ELECTRIC POWER ENGINEERING, ELECTRIC ENGINEERING AND ELECTROMECHANICS**

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### **MONITORING OF ELECTROMECHANICAL PROCESSES OF THE COLD ROLLING MILL TAKING INTO ACCOUNT THE VARIATION OF THE INERTIA MOMENT**

### **МОНІТОРИНГ ЕЛЕКТРОМЕХАНІЧНИХ ПРОЦЕСІВ СТАНУ ХОЛОДНОЇ ПРОКАТКИ З УРАХУВАННЯМ ВАРІЮВАННЯ МОМЕНТА ІНЕРЦІЇ**

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The automated system for monitoring electromechanical processes of rolling mills is a specific system, the quality of which depends on the