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# Military-technical cooperation as a direction of military-industrial complex development: prospects of military-civil fusion

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## **Abstract**

Theoretical foundations of military-technical cooperation were examined, highlighting the role of bilateral exchange of military and civilian resources in the development of the military-industrial complex. It is concluded that despite the undeniable importance and prospects of military-civil fusion, its implementation process may be prolonged and complex.

**Key words:** weaponry and military equipment, technological innovations, arms production, military-technical cooperation, military-technical policy, military-industrial complex, national security.

## **Introduction**

Despite the fact that initially military-civil fusion (MCF), known as military-civil fusion, was exclusively a Chinese strategy at the national level with a corresponding institutional apparatus (aimed at merging military and civilian technologies and resources to safeguard national interests), today an increasing number of countries recognize the prospects for the development of the military-industrial complex.

The integration of advanced civilian technologies stimulates the development of the military-industrial complex of a country, which is particularly relevant in the context of technological innovations within the Fourth Industrial Revolution (Industry 4.0). Among these innovations, leading ones include artificial intelligence (AI), autonomous systems (AS), Big Data, and Quantum computing.

Russian large-scale armed aggression against Ukraine has necessitated addressing issues related to changing priorities in the development of the state’s military-industrial policy. Currently, the flexibility and mobility of small businesses, along with the compact size of modern enterprises, constitute a significant advantage. Industry 4.0 technologies become a crucial element in enhancing the efficiency of military operations, making the effective establishment of a military-civil fusion (MCS) system by Ukraine conducive to the efforts of its Armed Forces in approaching our Victory. Utilizing existing or developing new commercial technologies will help avoid the common problem of “reinventing the wheel”.

## **Theoretical background**

The Ministry of Defense of Japan’s 2022 report highlights the government’s concern about China’s increasing use of artificial intelligence and military-civil fusion [1]. China aims to create “world-class armed forces” by the mid-21st century, pursuing intelligentized warfare by incorporating artificial

intelligence and other means, advancing a national strategy for the development of military-civil fusion to accelerate the bilateral exchange of military and civilian resources.

China's policy on artificial intelligence was initially outlined in the Plan for the Development of the New Generation of Artificial Intelligence, issued by the State Council of China in 2017. The document specifies that the use of military-civil fusion (MCF) is a fundamental condition for the development of artificial intelligence. China applies MCF as an approach to developing artificial intelligence based on the belief that the country can, so to speak, "outmaneuver" the United States [2].

The terminology associated with the military-civil fusion issue is relatively new; most scholars link it to the speech by former General Secretary of the Communist Party of China, Hu Jintao, at the 17th National Congress of the CCP (Chinese Communist Party) in 2007. In 2015, the current General Secretary, Xi Jinping, identified the strategy of military-civil fusion as one of the main national priorities, interpreting it as the "coordination of the development of civilian and defense technologies" [3, p.157].

Analysis of the Chinese strategy of military-civil fusion from the perspective of neoclassical realism and state governance theory suggests that the emergence of new technologies has provided states with a unique opportunity to enhance the mobilization of national resources, significantly boosting their military and economic power. Supported by collaboration between the People's Liberation Army of China, private companies, and state-owned enterprises, the Chinese strategy of military-civil fusion relies on technology exchange and the engagement of talented experts from abroad [4, p.98].

Chong A. and Jenne N., examining the issues of military-civil fusion in Asia, shed light on relevant contemporary practices for conditions of limited democracy, soft and absolute totalitarianism. The authors argue that military-civil fusion is worthwhile to consider through the lens of the concept of "Asian military evolution": while the military strives to implement Western standards, they need to adapt to local conditions [5, p.23].

Ams S. explores the socio-cultural, ethical, and political aspects of using artificial intelligence and big data for both civilian populations and the military. The author notes that today there is intense global competition between NATO, China, and Russia regarding Autonomous Decision Systems (ADS) and Autonomous Weapon Systems (AWS).

The shared use of artificial intelligence and data processing technologies contributes to the increasing risk of blurring traditional legal and regulatory boundaries between these spheres. This could lead to the weakening of global liberal democracy and an increase in the number of authoritarian police states worldwide [6, p.882].

Development of theoretical foundations for military-civil fusion in the context of enhancing the efficiency of Ukraine's military-industrial complex.

## ***Result and Discussion***

The participation of non-military companies in the design and manufacturing of weaponry is a longstanding practice. Even before the Second World War, military-industrial complex enterprises and commercial firms used shared technologies, and most types of military arsenal were produced by civilian companies. The Second World War and the Cold War contributed to the unprecedented expansion of the arms industry, which gained technological leadership in various fields, especially in the development of communication devices, production of composite materials, chips, and nuclear synthesis products.

Alongside, in some European countries, commercial companies were involved in the production of weapons only as raw material suppliers or subcontractors in the defense industry. The same applied to civilian scientific institutions, which during almost the entire Cold War period, only partially participated in projects related to the military sphere [7, p.114]. This situation was

driven by the belief among experts that the defense industry should play a leading role in arms production, with civilian enterprises serving as auxiliary links.

Considering the conceptual principles of Industry 4.0, such hierarchical subordination doesn't appear as clear-cut and unquestionable as before. Today, in many fields such as drone design and production, artificial intelligence, the Internet of Things, quantum computing, etc., civilian companies outpace others. As a result, "traditional" defense industry enterprises increasingly recognize the need for much closer collaboration with these companies at all stages of military research, development, production, and even throughout the entire lifecycle of weaponry and military equipment. An increasing number of commercial enterprises, previously overlooked as potential collaborators in military manufacturing, are now in high demand. For example, the active involvement of corporations like Microsoft and Google in the defense sector, their inclusion in national defense programs, poses a challenge associated with military modernization processes.

The successful implementation of the military-civil fusion concept at the national level can be demonstrated by the example of Israel. The uniqueness of this country's statehood lies in the fact that, on one hand, it increasingly faces asymmetric challenges such as constant rocket attacks, cyber threats, and terrorist attacks using COTS technologies (drones, sensors, IT systems, etc.). On the other hand, the citizens of Israel expect the government to implement an effective policy for a secure environment with clearly justified defense expenditures [8, p.70].

Many military researchers agree that the Israeli defense establishment is one of the most closed structures, resulting in a lack of official documents regarding the role of military-civil fusion in Israel's defense procurements. Analyzing individual publications in the form of scientific articles and analytical materials (mostly authored by former defense officials) allows outlining general trends and the specific nature of the Israeli concept of military-civil fusion.

In a presentation at the International Conference on Unmanned Vehicles (UVID 2017), Brigadier General N. Halamish, the Head of Research and Development at the Directorate of Defense Research & Development of the Israel Defense Forces, emphasized that "...continuous and thorough examination of technological progress enables the adaptation of civilian assets with minimal time and cost to meet unique military needs". Furthermore, he noted that the civilian sector is far better oriented toward issues of technological progress than the defense department [9, p.472]. On the other hand, as highlighted by E. Luttwak and E. Shamir, it is through the efforts of the Israel Defense Forces (IDF) that significant achievements in military technology have been made – from the initial use of drones to the well-known missile defense system "Iron Dome" and the laser weapon "Iron Beam". Lesser-known innovations in training, logistics, and human resources development are also noteworthy [10, p.113].

The number of Israeli advanced companies involved in Industry 4.0 technologies is increasing, significantly enhancing the potential for the development of military-civil fusion. For example, in 2018 (statistical data for recent years are not yet published), at least 230 startups were focused on Industry 4.0-related technologies [11, p.27]. Although Israel produces only a small variety of weapons, and its largest defense company ranks twenty-ninth among the world's leading defense companies [12], the country has become a global leader in various military technology sectors and is one of the top ten arms exporters. Well-established connections between state research institutions, investors, and the defense sector contribute to innovation implementation, the enhancement of weapon quality, and the expansion of the arms market [13, p.976].

At the same time, the complex dilemma addressed by the Israeli defense department in the implementation of Industry 4.0 technologies is related to the peculiarities of collaboration with civilian corporations. According to regulations, the Ministry of Defense can collaborate with domestic firms engaged in international technological exchanges. Despite the positive impact, this

creates additional risks, particularly the critical dependence of the country's military-industrial complex on potential changes in international relations.

However, Israel's case is somewhat exceptional, as the situation where the armed forces can simply find and integrate part of ready-made commercial technology ("plug and play") is atypical. Moreover, any involvement of private sector companies and civilian research institutions in military research and development is associated with numerous administrative, legal, political, commercial, and even cultural obstacles [14, p.35].

Technologies accompanying Industry 4.0 are increasingly experiencing rapid, often inadequately controlled dissemination. For instance, China already employs artificial intelligence and big data technologies to monitor the national social credit network, consolidating records from surveillance cameras, databases, and software that controls, evaluates, encourages, or restrains citizens based on their behavior. The United Kingdom utilizes artificial intelligence in facial recognition programs to identify potential terrorists and criminals, while Israel combines artificial intelligence and big data analysis to track illegal activities along its borders. National intelligence services use artificial intelligence tools to analyze online communications for tracking terrorist and other hostile activities against their countries.

Technological breakthroughs in military prowess are often referred to as "Revolution in Military Affairs" (RMA). It is typically seen as a kind of "new paradigm" in conducting military operations to fundamentally change the character and course of conflict due to a sharp increase in the military effectiveness of armed forces [15, p.461]. Scientific literature outlines several possible scenarios in which Industry 4.0 will significantly influence future strategies of conducting military operations.

Most frequently mentioned is the widespread use of armed, autonomous drones, "equipped with advanced sensors and connected to wireless command and control networks, where decision-making is based on artificial intelligence, and human intervention is limited only to deciding the use of lethal means". When performing tasks in a large swarm, these drones are remotely controlled by a single officer using sophisticated human-machine interfaces [16, p.131]. The scenario created in 2018 has now become a complete reality. However, the development of highly autonomous, precision drones remains the prerogative of technologically advanced countries. While technologies tend to be unevenly distributed among nations, less technologically advanced armed forces may not necessarily be condemned to perpetual lag. There are several less advanced technologies capable of bringing significant changes to the regional balance of power. Even small military, terrorist, and militarized organizations have found "compensatory" alternatives that enable them to asymmetrically compete with more technologically diversified adversaries. Additionally, there are discrete Industry 4.0 technologies (simple unmanned aerial vehicles, artificial intelligence, offensive cyber systems) that can be successfully integrated into the existing military structures of many less powerful states [17, p.8]. It is also worth noting that the world is currently undergoing a revolution in network interaction and social media. Relying on the enormous achievements associated with Industry 4.0 in the commercial sector, many countries are actively exploring the militarization of cyber and information operations: global international relations today, more than ever, foster hybrid warfare, with the destructive potential of cyber technologies being very high [18, p.91].

Today, Industry 4.0 technologies are directly related to military modernization processes. Adapting existing commercial technologies to military needs significantly saves resources, shortens the development and production cycle of new weapons, and reduces risks during their development. Above all, the military-civil fusion strategy enables defense enterprises and armed forces to implement the latest technological advancements in areas where civilian companies maintain leadership in innovation. Through the combination of MCF and Industry 4.0, there is a chance to gain significant advantages over the adversary in the coming decades. The main argument

in favor of this statement is the growing limitations of traditional defense industries in meeting the demand of armed forces for modern weapons and equipment.

### **Conclusions**

The concept of military-civil fusion (MCF) is a phenomenon of the 21st century that significantly differs from the 20th-century concept of civil-military cooperation (CIMIC). MCF is not merely about seeking and adopting civilian technologies in defense production. Primarily, it involves developing strategies and initiatives to search for and adapt relevant civilian technologies and products to military needs, as well as engaging the military in research collaboration with civilian organizations.

In contrast to MCF, CIMIC is based on combining defense and civilian potentials for the joint use of technologies and scientific-industrial capabilities. On the other hand, the CIMIC concept emphasizes the need to adapt innovative solutions developed in the civilian sector to military needs. Therefore, most countries that are starting to use Industry 4.0 technologies in the military sphere are currently forced to follow the traditional CIMIC path. This can be explained not only by the fact that there is no reason for the military to duplicate research and development within the framework of Industry 4.0 but also because the civilian sector noticeably leads in high-tech areas.

It should be acknowledged that the process of implementing military-civil fusion strategies will be an indisputable argument in assimilating Industry 4.0 technologies, but it will be quite complex. Firstly, it involves the need for the Ministry of Defense of Ukraine to define clear frameworks and parameters for the participation of civilian entities in defense projects: under what conditions civilian firms and research institutions can participate in military research and development work; which types of products should be assimilated into weapons and military equipment, and so on. Additionally, the participation of civilian organizations and firms in military procurement projects will require overcoming high entry barriers, which, in turn, may reduce the profitability of these operations. It is also worth considering a range of limitations associated with military-civil fusion projects: the need to participate in exhaustive tenders to obtain defense contracts; long sales cycles; additional expenses for compliance with security standards; restrictions on commercial rights to technologies and products produced under contracts with defense agencies; significant investments in infrastructure; the need to adapt to a non-commercial business environment, and so on. These and other limitations put civilian companies at a disadvantage compared to traditional defense enterprises and, in most cases, will limit their participation in such projects.

**Further research prospects:** Military-civil fusion as a key concept in military-technological innovation remains a poorly researched issue, necessitating the development of a basic methodological toolkit for this scientific phenomenon.

### **References**

1. On the Publication of Defense of Japan 2022. Available from : [https://www.mod.go.jp/en/publ/w\\_paper/wp2022/DOJ2022\\_EN\\_Full\\_02.pdf](https://www.mod.go.jp/en/publ/w_paper/wp2022/DOJ2022_EN_Full_02.pdf) (date of access: 08.12.2023).
2. Chinese 'intelligentized warfare' – Artificial Intelligence as the Latest Weapon. Available from : [https://ximera.com.ua/"2022/08/intelligentized-warfare/](https://ximera.com.ua/) (date of access: 08.12.2023).
3. Béraud-Sudreau L., Nouwens M. Weighing giants: Taking stock of the expansion of China's defence industry. *Defence and Peace Economics*. 2021. Vol. 2, No. 32. P. 151–177.
4. Muhammed C., Alena V. The Chinese Military-Civil Fusion Strategy: A State Action Theory Perspective. *The International Spectator*. 2022. No. 57. P. 85–102.

5. Chong A., Jenne N. Introduction: Asian Military Evolutions–Entrenching Varieties of Civil–Military Relations and Their Security Initiatives in Asia. *Asian Military Evolutions*. Bristol, 2023. P. 1–26.
6. Ams S. Blurred lines: the convergence of military and civilian uses of AI & data use and its impact on liberal democracy. *International Politics*. 2023. No. 60(4). P. 879–896.
7. Audra J. W. *Competing with the Soviets: Science, Technology, and the State in Cold War America*. Baltimore : Johns Hopkins University Press, 2013. 274 p.
8. Rabinovich M., Brun T. *Israel Facing a New Middle East. Offense and Defense in Israeli Military Doctrine* / ed. by A. Levite. New York, 2019. P. 63–106.
9. By 2030, One-Third of the IDF Ground Force will be Unmanned. Available from : <https://www.israeldefense.co.il/en/node/31691> (date of access: 08.16.2023).
10. Luttwak E. N., Shamir E. *The Art of Military Innovation: Lessons from the Israel Defense Forces*. Harvard University Press, 2023. 288 p.
11. Press G. 230 Industry 4.0 Startups in Israel Playing a Leading Role in Data-Driven Digitized Production. *Forbes*. 2019.
12. SIPRI. Top 100 Arms-Producing and Military Services Companies. 2017. Available from : [www.sipri.org/publications/2018/sipri-fact-sheets/sipri-top-100-arms-producing-and-militaryservices-companies-2017](http://www.sipri.org/publications/2018/sipri-fact-sheets/sipri-top-100-arms-producing-and-militaryservices-companies-2017) (date of access: 08.22.2023).
13. Palavenis Donatas. Adaptive Israel defense industry: myth or reality? *Israel Affairs*. 2021. No. 27. P. 1-15.
14. Lynch J. E. *Economic adjustment and conversion of defense industries*. Routledge, 2019. 312 p.
15. Michael R. The Sixth RMA Wave: Disruption in Military Affairs? *Journal of Strategic Studies*. 2021. Vol. 4, No. 44. P. 456–479.
16. Evron Y. 4IR technologies in the Israel Defence Forces: blurring traditional boundaries. *Defence Innovation and the 4th Industrial Revolution*. 2022. P. 122–143.
17. Schmid J. Technological Emergence and Military Technology Innovation. *Defence and Peace Economics*. 2022. No. 3. P. 1–19.
18. Soare S. R. European military AI: Why regional approaches are lagging behind. *The AI Wave in Defence Innovation*. 2023. P. 80–111.