

Public Administration Required in Ukraine for Private Space Rocket Engineering

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The author considers the historical and legal aspects of the development of the rocket and space industry of Ukraine as a heritage of the production of intercontinental missiles within the framework of the military-industrial complex (MIC) of the USSR. The reasons for the advent of the rocket industry in the context of the “cold” war of the 20th century and trends of the rocket and space industry of Ukraine from the structure of public administration remained within the military-industrial complex of the last century are considered. The possibility of overcoming the current impasse in public administration of the industry under the State Space Agency of Ukraine is evaluated, with the involvement of private rocket and space structures, which requires changes in legislation and reveals unresolved governance problems. The author argues that recognition of world trends and their reflection in the Ukrainian legal field is an urgent necessity. The potential way out of the current deadlock situation in public administration of the industry in subordination is evaluated. The analysis enables to determine the necessary actions in a lawful manner to increase the effectiveness of public administration of the Ukrainian rocket and space industry, challenging obstacles to this at the moment, and to make a proposal regarding the trend of formation of public administration of private space rocket engineering on the example of the Ukrainian space project “GreenSpace.”

Keywords: public administration, space activities, aerospace industry, law, industrialization of space, private sector, space and rocket industry.

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Introduction

Ukraine is at a critical juncture, searching for ways of effective public administration and reform of the existing space and rocket industry under the State Space Agency of Ukraine (SSAU). However, these ways may be suggested as a result of research on historical, political, legal and technical aspects, specific for previous periods and followed up in practice now.

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The current realities of public administration of private space rocket technology in Ukraine face several serious problems:

1. State monopolies remain, not only in the space industry of Ukraine; State-owned enterprise managers receive salaries and bonuses as a result of the monopoly itself and not as a result of deductions from income brought to the State. That is, managers have no interest in performance; moreover, the remuneration received by heads of State enterprises is ten times higher than that received by specialists, leading to unfair distribution of salary funds in State enterprises that violates social justice, while the level of management salaries is maintained by the dismissal of specialists (e.g., according to submitted declarations, the well-being of management of the M.K. Yangel State Design Office “Yuzhnoye” (Yuzhnoye SDO) is at a high level, while from March 2021 to August 2021, 1,040 high-level professionals were dismissed for lack of wages for them, and the process continues).
2. Corruption with embezzlement of budgetary resources in the space industry of Ukraine does not lag behind other departments (Kushnarov, 2018), it leads to the illegal enrichment of management: on 10 September 2021, the Verkhovna Rada of Ukraine adopted Resolution 5477 on the establishment of the Temporary Commission of Inquiry; the objective of which is: “investigation of possible unlawful acts committed by officials of the State Space Agency of Ukraine (National Space Agency of Ukraine), including the implementation of Ukraine’s national targeted scientific and technical space programmes; management of State enterprises, economic societies that are (were) under the Space Agency; determination of the reasons for the decline in the financial and economic indicators of the space-related enterprises of Ukraine, the inadequate quality of management and the failure to fulfil the obligations entrusted to the Space Agency; investigation of cases of the bankruptcy of Ukrainian space-related enterprises, abuses in their privatization and the causes and effects of the liquidation of such enterprises; investigation of cases of illegal transfer, sale and other alienation of technologies in the space sector; establishment of evidence of the inappropriate and inefficient use of technologies in the space industry, as well as their inadequate protection (On the establishment, 2021); and finally, investigation of possible wrongdoing in the course of the failed “Lybid” and “Cyclone 4” projects.
3. In Ukraine, a clan-based system of interest in the development of certain high-income sectors of the economy with minimal investment in their provision exists, that is, interest in obtaining a super income at minimal cost for enriching a small part of the citizens of Ukraine, while the rocket and space industry has always been high-cost, but it reflects the interests of the State in developing a high-technology industry, this contributes to the lack of State contracts needed by the Ukrainian rocket and space industry.
4. Ukraine lacks a plan for social and economic development to enhance the well-being and welfare of citizens due to impulsive actions of the Verkhovna Rada, the President and the Cabinet of Ministers of Ukraine for solving immediate problems.
5. Not only the internal clan system, but also the external pressure of foreign States acting in their own interests, are seriously hampering the development of the Ukrainian rocket and space industry, for example, the US State Department periodically sends to the Ministry of Foreign Affairs of Ukraine “letters of regret” about the travel of Ukrainian specialists to China, one of the world’s leading rocket and space

countries with huge resources for joint work with Ukraine (Soroka, 2019); since 1991 the Russian Federation has made a lot of efforts to destroy the basis of the defence industry in Ukraine, for example: aluminium smelter (PJSC “ZAIK”), and “Ukrgrafit” in Zaporizhzhia, “Dniproshyna” in Dnieper do not produce for the space industry, JSC “Nikopol Welded Pipe Factory” was closed in 2017 (these and other enterprises were built to ensure production of ICBM in Ukraine), the Donbass factories have been taken away from Ukraine and destroyed: the only way to escape foreign influence is the independent course of the State of Ukraine in the process of the development of industry and other branches of the economy.

The author uses the results of research in the former Soviet Union and in the world, taking into account historical aspects of various periods of the development of public administration of space activities, by Alexey Zhrebtsov, Natalia Malysheva, Larysa Soroka, whose work is further referred to.

Prerequisites for development of space and rocket technology under legal confrontation between States

World trends in the development of the rocket and space/aerospace industries have identified three evolutionary stages (Alamalhodaiei, 2021):

1. Old Space or Heritage Space involves everything created by the governmental structures of different countries, with almost unlimited financing from the budget, because the introduction of developed technologies into the economy was considered optional and even impossible due to the increased level of secrecy in the interests of defence. Hence, Old Space has assumed non-renewable defence costs.
2. New Space provides for the use of private business by attracting both public investment (Space-X, Rocket Lab in the United States, and some others) and venture investment companies from own funds (Firefly Aerospace in the United States), as well as the participation of non-State companies in projects of State corporations (participation of JSC Dneprotyazhmash in project Cyclone-4, Yuzhnoye SDO), which implies a reduction of total costs and payback of implemented projects.
3. Industrial Space aims at integrating space technologies into the economies of countries; this trend is supported by the legislation of two countries, the United States and the Grand Duchy of Luxembourg, which have the right to extract minerals from outer space and to use them, for example, in 2021, in the United States, Varda Space Industries launched the first Orbital manufacturing start-up with \$42 million from a group of investors (Khosla Ventures, Caffeinated Capital, Lux Capital, General Catalyst, Founders Fund).

The rocket and space/aerospace industry should generate profits and extra profits from the use of space technologies.

At all these stages of development, public administration of the rocket and aerospace engineering industry is changing significantly. Ukraine, unfortunately, remains in a flawed phase of Heritage Space, in which the concepts and future programs of the SSAU are doomed to failure. At present, Ukraine has ceased to be perceived as a spacefaring nation in the world, and Ukraine is of interest to some countries only as a producer of USSR-era ICBMs.

Historically, Ukraine is a fragment of the Imperial USSR with a highly developed MIC with a share of 25% and a system of central administration in the form of the Soviet model MIC (Pikhoia, 2016; Bystrova, 2010; The Soviet, 2010). With regard to missile technologies (the basis of the future space industry of Ukraine), there was a so-called missile “South Bush” (Domestic, 2013), which formed the technical equipment of the Strategic Missile Forces of the USSR (Krivolapov, 2019; Smirnov, 2016). Immediately after independence, Ukraine established Rocket and Space Forces Command in Kyiv (On Military, 1991). Then these forces were disbanded (on 5 April 1992, 43 missile armies with 5,000 nuclear weapons were incorporated into the Armed Forces of Ukraine by Presidential Decree 209 and then disbanded by 01 June 1996, all nuclear warheads were removed to the Russian Federation), and intercontinental missiles removed from alert and destroyed (by 30 October 2001) under international agreements (Antonov, 2012; Memorandum, 1994; On Ukraine’s, 1994) or transferred under various conditions to the Russian Federation by 2004, as well as all completed and unfinished Ukrainian projects (From Confrontation, 2004).

The established National Space Agency of Ukraine began to form scientific and technical programmes, for which the Law of Ukraine “On Space Activities” (On Space, 1996) was adopted. For some period, missile factories and organizations in Ukraine remained orphaned, and then they became subordinate to the transformed State Space Agency of Ukraine (1999). In fact, independent Ukraine received a huge missile heritage from the former Soviet Union and in 1991 was significantly higher than, for example, the People’s Republic of China (Lee, 2013). By 2021, Ukraine’s rocket and space industry had been completely destroyed (Levenko & Drozdenko, 2021), and the People’s Republic of China had taken the leading positions in the world with its moon rovers and Mars rovers, an orbital station and emergency-free launch vehicles launching hundreds of high-quality satellites from China’s cosmodrome (Zhelezniakov, 2021; Kashin, 2016; Blue, 2021). Nowadays, Ukraine cooperates with China (Soroka, 2021) and buys in China high-resolution Earth remote sensing data directly from Chinese satellites flying over Ukraine.

Therefore, in the post-Soviet period, Ukraine lost the defensive vector inherent in the missile component of the MIC. So far, it has not adapted to the challenges of the peaceful exploration of outer space with the commercialization of space technologies. This problem can be solved by establishing public administration of private space rocket production as one of the promising types of space activity in Ukraine.

Space rocket engineering in Ukraine and specificities of its public administration

Let us briefly discuss the specificities of public administration of space rocket engineering at all stages of development mentioned above.

The first United States ballistic missile was successfully tested in 1958 (ICBM Atlas) and in the USSR in 1957 (R-7).

The system of public procurement and administration was innately different in these countries: it was a political issue related to the legal framework of each country. As early as 1957, the United States produced the world’s first submarine-launched ballistic missile Polaris A1. Since 1960, these rockets had been launched at Cape Canaveral, their rungs fell into the Atlantic, and their second rungs ended up in the middle of the ocean, where they were successfully fished by Soviet fishing trawlers. The author was fortunate in his occupation to

disassemble and study the Polaris A1 steering wheel drive. While the Soviet Union produced more powerful and perfect copies of Aggregate-4 (Germany) until almost the 1970s, in that case, the author saw a technique that we had not had yet. The drive was powered by a hydraulic amplifier, where the gap between the cylindrical plunger and the shuttle sleeve was two microns. Up to the end of the USSR, it was possible to make the same with a gap of at least five microns. There were other interesting design solutions too.

Initially, in the USA, the industrial base was more developed, all branches of the economy worked effectively (Post-war, 2017). Already in the 1960s, liquid rocket engines were manufactured on the conveyor.

The most interesting thing the author saw was that on every hull part of the American steering wheel drive, there was a round blue ink seal: Kodak, 1957. The USA engaged private corporations in production, including the camera company Kodak. It specialized in missile control systems, designed and manufactured satellites, including those with nuclear power plants (Kodak Research Laboratories / Engineering Research Division).

In the USSR, the administration was simpler, without taking into account historical and world experience (Zharebtsov, 2016): all financial resources of the country were mobilized, at 2 a.m. the Minister of the special Ministry carried out operation meetings at the serial missile factory p/ya 186 (future Yuzhmash), the State security services exercised total control, it has not been common to write about this until now. In the absence of developed industry and technology manual labour flourished; first machines with digital programme control developed on Yuzhmash only in the 1970s. Besides, the plant had to be transformed from the largest in the USSR post-war automobile plant. The city of Dnipropetrovsk was closed to foreigners, while usually settlements and small towns in the Russian hinterland, in Siberia, on the Urals were closed.

Inside the secret factory, p/ya 186, an even more secret design bureau p/ya 2289 was created.

At first, the standards for effective cooperation in missile production were absent. Therefore, so-called "Guiding Documents," secret folios, were used, which regulated all requirements for constructions, their testing and their manufacture. Later there were secret military GOSTs, followed by the Unified System of Design Documentation, the Unified System of Technical Documentation, the Unified System of Technological Documentation. This was necessary because materials, parts, individual products were produced by hundreds of thousands of general technical enterprises (at which, by the way, military reception was introduced with increased requirements for the quality of production).

For example, the Moscow region plant manufactured steel gramophone needles. Without them, the cases of solid rocket engines could not be made. Therefore, needles continued to be manufactured even after the gramophones had ceased to be used.

A centralized system of public administration for intercontinental ballistic missiles in the USSR was formed. The administration was carried out directly from Moscow under the control of special commissions of the CPSU CC and the Cabinet of Ministers of the USSR.

One such missile segment of the administration was the industry of the Ukrainian SSR.

After the collapse of the USSR and the declaration of independence, the public administration of missile enterprises of Ukraine did not change. Still, at the same time, the administration centre (Malysheva, 2018) disappeared, and the government of Ukraine did not load missile factories with State order.

Reform was needed, and the enterprises themselves understood this first and foremost. As early as a quarter of a century ago, Yuzhmash workshops were given the right to create scientific production enterprises according to their work profile, to employ designers from the Yuzhnoye SDO. Unfortunately, they did not gain legal independence remaining within the State enterprise, and their products proved to be uncompetitive at a high price and a low level of technical excellence: Yuzhmash could only effectively manufacture intercontinental missiles (during the years of independence in Ukraine, only six technically imperfect experimental satellites were additionally designed by the Yuzhnoye SDO and manufactured by Yuzhmash). However, this tradition remained, and until now is used in the Kyiv State Joint-Stock Holding Company Artem (production of missile weapons), 1996 (Artem, 2021).

Later the structures of some State enterprises under the State Space Agency of Ukraine were reformed.

JSC Hartron was divided into 15 enterprises (JSC, 2021). The State Joint Stock Holding Company Kyiv Radio Plant united 16 enterprises (Kyiv, 2021), including private company Elmiz, company Kurs. Arsenal State Enterprise of Special Instrumentation was divided into three enterprises (Arsenal, 2021), in particular private company Skynet.

It should be noted that the number of independent and non-State space-orientated enterprises has constantly been increasing in Ukraine. Laboratory of Advanced Rocket Engines LTD (production of aircraft and spacecraft, satellite equipment, registered in 2016, works with foreign partners through the Ukrainian Scientific and Technical Centre) works only in Dnipro; R&D-centre (Noosphere Association) works with Firefly Aerospace (USA) and Skyrora (UK); Space Logistics Ukraine; SkyEnergy LLC works with ISISPACE (Netherlands) and others.

2021 for Ukraine became the Rubicon, having passed which space industry in Ukraine should become alternative. It will require the administration of partially private but fully State-controlled industry (On Space, 1996). Since the adoption in Ukraine of Law 1071, which enables non-State companies to engage in space activities, including firing tests, the real situation has only been regularized (Posheliuzhnaia, 2021); this has been accepted as a signal that the State supports space activities that can contribute to the State budget.

It should be considered that this is possible only under the “industrialization of outer space.” The former canons should be rethought in order to realize that industrialization requires entirely different technical means and other public administration.

The first stage (Old Space) was supported with intercontinental missiles with parameters: maximum range, maximum accuracy, a maximum weight of the combat unit, maximum convenience for military specialists.

The second phase (New Space) requires a reduction in the cost of taking cargo into space and comparatively cheap spacecraft.

The third phase requires:

- a) Low-cost reusable means of transporting cargo into orbit and returning products from space to Earth;
- b) Low-cost and reliable reusable environmentally friendly engines;
- c) A simplified start-up system with no construction and maintenance costs, e.g., taking into account the closed location of the territory of Ukraine, with limited alienation fields at start;
- d) Switch to low-cost, reliable, high-tech, low-mass spacecraft (lower cost of satellite launch);
- e) International cooperation.

Why are the State enterprises of Ukraine not ready for the realities of the “third stage”?

First. Monopoly status of leading space industry enterprises (Competition, 2020). Leading Yuzhnoye SDO does not want to give up the designs of combat missiles and design launch vehicles with a vertical flight of the first stage (for a significant reduction of fields of alienation): even the heavy-lift launch vehicle of China Long March-5 for the first stage (liquid launch accelerators CZ-5-300) requires a territory of length 90 km and width 30 km (China, 2020), while in the projects of Ukrainian Yuzhnoye SDO it is hundreds of kilometers (Karpus, 2019).

Second. Reluctance to stay ahead of the world’s technological advances due to the lack of motivation. It is enough to compare the new Earth remote sensing satellite Sich-2-1 with the European one; Ukrainian apparatus is worse in parameters than CubeSat-6, which has a ground resolution of 4.75 m, useful life of 5 years, the weight of 6 kg, additional control of air traffic is carried out (controls for airport controllers without ground radar, implemented in North America, Europe, partly in China).

Third. The reluctance of the State to establish Ukrainian GOST systems. Ukraine has virtually no State standards in the space industry (with the exception of a few for Earth remote sensing). Under an international agreement, Ukraine uses GOSTs of the USSR (in Russian, as the language of international communication), which results in prohibiting the use of certain GOSTs by the State Space Agency of Ukraine without offering anything in return. At present, any space projects should be on the basis of standards: in Ukraine, they should be carried out in Russian, since there are no standards in Ukrainian, which is totally contrary to the public policy of Ukraine and reduces opportunities for State enterprises.

Fourth. The imperfection of public administration of the space industry within the remnants of the USSR-era MIC, inherent only to the first stage of the Old Space. It is necessary to abandon State programs with the “sole performer” in Ukraine, because it is nothing other than monopoly and corruption, which contradicts the legislation of Ukraine.

Fifth. The conservatism of State enterprises, which are already accustomed to a closed type of activity, separated from State plans for social and economic development: the development of the industry is carried out for the industry. In the PRC, for example, the opposite is true: the plans and activities of enterprises and organizations of rocket and space activities are included in China’s five-year socio-economic development plans and are mandatory even at the regional level (Levenko & Drozdenko, 2021). Accordingly, the implementation of plans in China is subject to serious State and party control. Why should Ukraine not adopt some of the Chinese experience? There are many parties, but the leading party, the CPC, is present in all structures and is also responsible to the State for failure to implement plans. In Ukraine, a similar situation has developed: the party “People’s Servant” is present in all branches of government but is not yet ready to control everything in the interests of the development of the State and to be responsible for failure to implement plans. The party forms a majority in the Verkhovna Rada and adopts, for example, the space program of Ukraine and should not remain an outsider.

Sixth. The reluctance of state-owned enterprises to receive income and profits, which is possible with irrevocable financing of works (with corruption component of enrichment on legal grounds of management of state-owned enterprises). Unwillingness to sell own products on the world market is evidenced by the innumerable appeals to the SSAU and management of foreign enterprises, and as a result, there are only a few commercial projects that cannot feed the industry.

Seventh. The State is not interested in Technoparks, which aim to transfer technologies to Ukraine, import-substitution, and develop production facilities. Moreover, technical universities are being dismantled for the training of specialists, specialized colleges, and industrial and technical colleges.

It is possible to continue. However, what is already being done on a private initiative in the space sector should be noted.

GreenSpace as a promising Ukrainian private rocket engineering project

One of the new private space companies of Ukraine, Science & Space LLC, guided by the principles of public administration and aware of the importance of the industrialization of outer space for the economy of Ukraine, has developed a Technical Proposal for a new launch vehicle GreenSpace (RCK) suitable for use in Ukraine.

First of all, technology should be considered. The launch vehicle implies the latest achievements of the Ukrainian rocket engineering of the USSR-era, developed in the system of the military-industrial complex, which are now not used by state enterprises under the State Space Agency of Ukraine.

It is a fire dynamic launch from a launch pod container. This launch significantly simplifies the launch site requirements and preserves the launch vehicle with useful cargo until launch in a normal climatic environment. In contrast to the military variant, the launch pod container does not use a powder pressure accumulator, instead water is filled, and the steam overheated by hot jet of a liquid propellant engine performs the work of a conventional steam engine: discharging the missile from the container at speed required. This enables to place the entire flight control system and the operating mechanisms of this system on the second stage of a two-stage rocket. The engines in the rocket are fixed motionless, the head part with a useful load is deflected, changing the position of the centre of mass relative to the drive vector of the engine, and in dense layers of the atmosphere, this enables to apply of aerodynamics.

The swing of the head part for flight control is well known and described (Igдалov et al., 2004). The launching of rockets from a launch pod container (Karpenko et al., 1999) is also well known. The combustion of liquid non-cryogenic fuel in the rocket engine also generates steam. Technically it is a modern environmentally safe rocket “steam engine,” a working horse of space industry. The design and use of the launch vehicle are patented in Ukraine (Patent, 2021).

The complex is designed for the launch of modern CubeSat satellites to a sun-synchronous orbit with altitudes from 500 to 900 km to monitor the territory of Ukraine and other countries: one launch is capable of forming an entire constellation of dozens of satellites in orbit.

It is possible to modify the vehicle: the design makes it possible to increase the number of chambers of similar liquid rocket engines. As a result, it is possible to launch a cargo of up to 500 kg or an orbiter with a space plant into space for the production in vacuum and weightlessness of unique products up to 100 kg. This flexibility is provided by a system for supplying fuel to the engine at a high nitrogen pressure without the use of a turbo-pump unit. High-pressure tank residues are used for the controlled return of the first and second stages by parachuting them and by plucking stages out of the sky using a helicopter.

The launch vehicle and the launch pod container are reusable, and the rocket can be launched up to 10 times (the results of the tests may lead to an increase in the number of launches), and the next launch is possible within 24 hours.

Thus, the technology is well suited for the stage of “industrialization of outer space.” Moreover, the possibility of launching a launch vehicle from the territory of the former bombing range on the peninsula of Yegorlytskyi Kut has been worked out. The track runs over the Black Sea, and the first stage lands at a distance of no more than 200 km from the launch point above the sea. The second stage crosses the Turkish air border at an altitude of over 100 km. In the event of an emergency and the failure to restart the second-stage engine to reach the required altitude, the second stage will fly on a ballistic trajectory and parachute into the Sahara Desert at the border crossing point between Libya, Sudan and Chad.

This launch completely contradicts the official view that it is impossible to launch a launch vehicle in Ukraine. Perhaps, we need to understand which missiles Ukraine needs.

Technically, private initiative is quite applicable in Ukraine.

With regard to the public administration of private space rocket engineering, Ukraine is theoretically ready: the legislative basis is sufficient, the management structure of a private company has no relation to the vertical military-industrial complex, Ukraine can buy most units, assemblies, fuel components in Europe (Ukrainian and European legislation allows). Cooperation with other private enterprises of Ukraine, joint-stock companies, investment funds is possible. However, even attempts to include the private enterprise, or more precisely its subject matter, in the space programme is not supported by the management of the SSAU. This is due to the inability of public administration by the SSAU in accordance with the legislation of Ukraine: Regulations on the SSAU (Regulations, 61), by-laws of the CMU and other governing documents do not specify the rights of private enterprises.

Moreover, private space companies are ready to execute orders of State structures of Ukraine. Therefore, effective public administration will produce results as soon as possible with high economic efficiency. Foreign experience demonstrates this under completely different systems of government (USA, PRC, Republic of Korea, Islamic Republic of Iran, and Germany). All of these countries are present in outer space; all of them do not use the public sector of the economy.

There is a readiness to pass the Ukrainian Rubicon and join the world community of the space industry (Kushnarov, 2018). Of course, by working for the benefit of the country, private space companies hope not only for government control, but also for support. The efficiency of the space industry requires in the first years of a specific project that: the company is exempt from taxes (before the project is put into operation), components can be imported without duty; this does not require financing from the State. Genuine support implies concessional loans granted to the private space industry under State guarantees if the project is approved and accepted into the State space program.

Such enabling environment for private space rocket engineering should be created in Ukraine, and a new system of public administration of the space industry should be established.

Conclusions

The effective operation of the Ukrainian space industry and proper public administration of the private space rocket engineering require:

- a) Unconditional introduction of legislation into the practical activities of State and non-State administrators;
- b) Planning in the interests of the State in accordance with the provisions of Ukrainian legislation;

- c) Corporatization of space State enterprises with changes in the system of legal administration;
- d) Introduction of a system of authority in Ukraine at all levels with imminent liability for violations of the law at all levels of administration and for the absence of programmes for the social and economic development of the country and of individual branches of the economy; and liability for failure to comply with their duties in general.

This does not require additional funding. It is enough for Ukraine to become a State really governed by the rule of law in the context of the laws already adopted, with their number limited and with the transition to quality.

This is possible provided the adoption of the Fundamental Laws of Ukraine by the Verkhovna Rada to eliminate the ambiguity in the country that generates negligence and to eliminate the legalization of illegally appropriated finances and industrial and infrastructural facilities; on the basis of introducing people's rule in the form of referendums as a system for monitoring the actions of the authorities; introduction of planning for the social and economic development of Ukraine with a view to improving the standard of living of Ukrainian citizens.

In this context, public administration of the space rocket industry will function as national law and order. This industry cannot exist in a closed structure, separated from the State.

The study of the causal relationships that determine the logic of the events and the final outcome of the actions led to the conclusion that what needs to be done is known, but at present, this is not possible.

References

- Alamalhodaiei, Aria (2021) Varda Space Industries closes \$ 42M Series A for off-planet manufacturing. *TechCrunch*. Available online: <https://techcrunch.com/2021/07/29/varda-space-industries-closes-42m-series-a-for-off-planet-manufacturing>
- Antonov, A.I. (2012) *Arms Control: History, State, Prospects*. Russian Political Encyclopedia (ROSSPEN); PIR Centre. [in Russian]
- Arsenal (2021) ARSENALCDB. State enterprise of special instrument making. Official site. Available online: <http://arsenalcdb.com.ua/index.php/en/>
- Artem (2021) State Joint Stock Holding Company. Official site. Available online: <https://www.artem.ua/index.php>
- Blue Book: The number of launches in China in 2021 is expected to exceed 40 times for the first time (2021) *FINANCE.SINA*. Available online: <https://finance.sina.com.cn/tech/2021-02-24/doc-ikftssap8517385.shtml>
- Bystrova, I. (2010) Military-industrial complex of the USA and the USSR: Constitutional and political aspects of functioning. *Proceedings of higher educational institutions. Volga region*, No. 1 (13), 36-43. [in Russian]
- China Completes the First Controlled Landing of the Side Booster of the Changzheng-3B Launch Vehicle. (2020) *Aviation and Space News*. Available online: <https://avianews.info/kitaj-osushhestvil-pervuyu-upravlyaemuyu-posadku-bokovogo-uskoritelya-rakety-nositelya-chanchzhen-3b/> [in Russian]
- Competition Policy in Eastern Europe and Central Asia (2020) Regional Centre for Competition OECD-GVH in Budapest (Hungary). *Newsletter* No. 15, July. Available online: <http://www.oecd.org/daf/competition/oecd-gvh-newsletter15-july2020-en.pdf>

- Domestic military-industrial complex and its historical development* (2013) 2nd ed. Ed. by O. Baklanova and O. Rogozina. Society for the Preservation of Literary Heritage. [in Russian]
- From Confrontation to International Cooperation* (2004) Ed. by S. Koniukhova. ART-PRESS.
- Igdalov, I., Kuchma, L., Poliakov, N., and Sheptun, Yu. (2004) *Rocket as a Control Object*. ART-PRESS. [in Russian]
- JSC Hartron (2021) Official site. Available online: <http://www.hartron.com.ua>
- Karpus, Vadim (2019) Design Bureau “Yuzhnoye” is Developing a Light Rocket “Cyclone-1M”, Which can be Launched From the Territory of Ukraine. ITC.ua. Available online: <https://itc.ua/news/kb-yuzhnoe-razrabatyvaet-lyogkuyu-raketu-tsiklon-1m-kotoruyu-mozhno-budet-zapuskat-s-territorii-ukrainy/> [in Russian]
- Karpenko, A. and Utkin A., Popov A. (1999) *Domestic Strategic Missile Systems*. SPb.: Nevsky Prospect. [in Russian]
- Kashin V. (2016) Development of China’s nuclear forces: the beginning of deep transformation. *The contours of global transformations: politics, economics, law*. Vol. 4, Issue 9, 77-94. Available online: <https://www.ogt-journal.com/jour/article/view/283> [in Russian]
- Krivolapov, Alexey (2019) Present and future of the Ukrainian defence industry. *Russia and the new states of Eurasia*, No. IV (XLV). 125-135. Available online: <https://www.imemo.ru/publications/periodical/RNSE/archive/2019/iv-hlv/ukraine-today/the-present-and-future-of-ukrainian-defense-industry> [in Russian]
- Kushnarov, I. (2018) *Political Corruption: Comparative Political Science Conceptualization*. Yurydychna dumka. [in Ukrainian]
- Kyiv Radio Plant (2021) State Joint Stock Holding Company. Official site. Available online: <http://krz.kiev.ua>
- Lee, Chenjie (2013) Progress of Space Technologies in China 1. Eds. Bao Ou, Han Ihua, Yu. Baturin, B. Dyakov, B. Ivanov, and D. Saveleva. SPb. Nestor-Historia. Available online: <http://epizodyspace.ru/bibl/li-chenchji/razvitie/li-razvitie.pdf> [in Russian]
- Levenko, O., and Drozdenko O. (2021) Comparative legal analysis of the administration of space activities in Ukraine and China. Dominant Print. [in Ukrainian].
- Malysheva, Natalia (2018) *Space law and policy of post-Soviet states*. International publishing house ELEVEN. The Hague. The Netherlands. [in Ukrainian]
- Memorandum on security guarantees in connection with Ukraine’s accession to the Treaty on the Non-Proliferation of Nuclear Weapons of 1 July 1968 (Budapest Memorandum) of 5 December (1994) Verkhovna Rada of Ukraine. Available online: https://zakon.rada.gov.ua/laws/show/998_158#Text [in Ukrainian]
- On Military Forces of Ukraine (1991) Law of Ukraine of 06 December 1991 No 1934-XII. Available online: <https://zakon.rada.gov.ua/laws/show/1934-12#Text> [in Ukrainian]
- On Space Activities (1996) Law of Ukraine of 15 November № 502/96-VR. Available online: <https://zakon.rada.gov.ua/laws/show/502/96-%D0%B2%D1%80#Text> [in Ukrainian]
- On the establishment of the Temporary Commission of Inquiry of the Verkhovna Rada of Ukraine to investigate possible illegal actions of officials of the State Space Agency of Ukraine (National Space Agency of Ukraine) and space companies, in particular during the implementation of projects “Lybid” and “Cyclone-4”(2021) Resolution 1747-IX of the Verkhovna Rada of Ukraine of 10 September. Available online: <https://zakon.rada.gov.ua/laws/show/1747-20#Text> [in Ukrainian]

- On Ukraine's accession to the Treaty on the Non-Proliferation of Nuclear Weapons 1968 (1994) Law of Ukraine of 16 November №248/94-VR. Available online: <https://zakon.rada.gov.ua/laws/show/248/94-%D0%B2%D1%80#Text> [in Ukrainian]
- Patent of Ukraine for the invention "Rocket and space complex"(2021) GreenSpace with a launch vehicle with cold engines and a method of controlling the flight of a launch vehicle UA 123891 C2 from 16.06.2021.
- Pikhoia, R. (2016) New publications on the formation of the Soviet military-industrial complex. *Russian history*. Vol. 5, 196-204. [in Russian]
- Posheliuzhnaia, Christina (2021) Demonopolization of the Ukrainian Space Market. *Legal practice*, №40. Available online: <https://pravo.ua/articles/usvoenie-kosmosa/> [in Russian]
- Post-war reconstruction and development in the Golden Age of Capitalism (2017) World Economic and Social Survey. Available online: https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESS_2017_ch2.pdf
- Regulations on the State Space Agency (2015) Resolution 281 of the Cabinet of Ministers of Ukraine of 14 May 2015 (as amended by the Resolution 819 of the Cabinet of Ministers of Ukraine of 7 September 2020). Available online: <https://www.nkau.gov.ua/ua/dka-ukrainy/polozhennia-pro-dka> [in Ukrainian]
- Smirnov, L. (2016) *At the origins of rocketry*. To the 100th anniversary of the birth of L.V. Smirnov. Ed. by N. Mitrahov, V. Platonov, A. Stetsenko, V. Tkachenko, A. Degtyareva. Space-Inform. [in Russian]
- Soroka, Larysa (2021) Space Doctrine and the Future of the Space Industry. *Philosophy and Cosmology*. Volume 26, 25-34. <https://doi.org/10.29202/phil-cosm/26/2>
- Soroka, Larysa (2019) Bilateral Relations Between Ukraine and China in Space. *Actual Problems of Domestic Jurisprudence*. Special issue, Volume 2, 133-135. Available online: <http://apnl.dnu.in.ua/tom2/30.pdf>
- The Soviet Defence-Industry Complex from Stalin to Khrushchev* (2010) Ed. by J. Barber and M. Harrison. Houndmills.
- Zhelezniakov, A. (2021) Space activities of the countries of the world in 2020 (Twenty-second annual review). St. Petersburg. Available online: <http://space.com.ua/2021/01/01/pidsumki-kosmichnoyi-diyalnosti-krayin-svitu-v-2020-rotsi-vid-oleksandra-zheleznyakova/> [in Russian]
- Zherebtsov, Alexey (2016) Essay on the history of the formation and development of the science of Russian administrative law (part 3). *Bulletin of The Krasnodar University Of The Mia Of Russia*, No. 3 (33), 137-143. Available online: https://mvd.ru/upload/site119/folder_page/003/494/680/v2016-3-2.pdf [in Russian]