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DEVELOPMENT OF NATIONAL LOGISTICS IN SUPPORT OF THE SERBIAN AIR FORCE - LONG-TERM PROSPECTS

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Abstract:

Introduction/purpose: The Air Force accomplishes its tasks in the airspace where it must use special equipment and weapons which makes it extremely technically demanding. This reliance on technique speaks of the importance of logistics in the Air Force. Support to the Air Force of the Serbian Armed Forces is provided by national logistics through, among other things, various branches and parts of industry such as military industry - part of industry that deals with the production and trade of weapons and military equipment.

Methods: The methods applied in the paper are the analysis of the tendencies of development of modern aviation assets and military industries in the world as well as the synthesis considering the state of national logistics today and its possibilities of supporting the Serbian Air Force through its basic sources.

Results: Basic sources and possible prospects for further development of national logistics are considered, with the focus on the modernization of aircraft and other assets, military personnel training and improvement of their standard of living as well as on the cooperative development of joint projects with foreign partners.

Conclusion: It is important to be directed towards creating the conditions for long-term prospects of the development of national logistics in support of the Serbian Air Force.

Key words: Air Force, Serbian Armed Forces, logistics, armaments, military equipment, situation and prospects.

Introduction

When talking about the main drivers of development of any society, one of them certainly is national logistics, which provides, through production and/or import, necessary material resources for the needs of the armed forces, economy and civil society. There is no social activity that is immune to it. It paves the way for a better tomorrow, a developed economy, a modern society and a better life for all citizens. As such, because of its importance, it is the responsibility of the political power of the state, that is, the government. (Fechner, 2010)

Dynamic development of air forces in the world imposes the need for their equipping with new modern assets. Aircraft assets are high technology products and require a high degree of processing. The organization and realization of the production of these assets is a complex process. Economic principles require a comparison of the costs of production and the cost of imports, and, as a result of such a comparison, many countries would find "profitability" in imports. However, some factors call this choice into question: political, social, security, technical-technological ones, etc. By building their own (military) production facilities, developing a scientific-research base, as well as by employing their workforce, [countries] create the conditions for their own production in relation to international logistics¹. (Milanović et al, 2009, pp.1-14)

On the other hand, regardless of the consequences of the economic crisis and high costs of modern aircraft, national logistics will find opportunities for the procurement of modern aircraft from imports, and will still continue to rely on its own capacity.

The problems posed in this way raise a fundamental question - what are the long-term prospects for the development of military industry, i.e., national logistics, so that it can be able to meet the requirements of the Air Force.

¹ International logistics can be defined as the process of planning, implementing and controlling the flow and storage of products and supplies, and related information, from place of origin to place of consumption located in another country.

Trends in the development of modern aeronautical assets and military industries in the world

Since air forces have considerable importance and capabilities in contemporary armed conflicts, most developed countries devote special attention to their development. By stimulating their national logistics, by investing in the development, technology, production and modernization, they seek to support their Air Forces with state-of-the-art aircraft.

Generations in the development of multipurpose fighter jets

Air forces in the world have been developing dynamically. Since the advent of the first jet aircraft, with respect to their combat effectiveness, the degree of application of new technologies and trends over a given period of time, the development of fighter jets has been categorized into so-called generations (Figure 1).

The *first generation*² is characterized by the appearance of a jet engine and covers all jet fighters from their appearance until 1955. They differed very little from their predecessors with the piston-driven drive in appearance and construction. The cannon remained the main weapon. In order to achieve a decisive advantage over the opponent at maximum speed, the only scope for improvement was by replacing the drive system, since the previous one exhausted all possibilities in that field. The first jet-powered serial aircraft are also the first representatives of the first generation of jet fighters Messerschmitt Me 262 and Gloster meteor.

The *second generation* is characterized by the beginning of the use of passive surveillance radar without the possibility of rocket guidance and the emergence of air-to-air missiles with passive IR guidance. It lasted until 1965. The development of the second generation of fighters was shaped by technological advances, lessons learned from air combats during the Korean War, and by focusing on the dangers of a possibility of a nuclear war. Significant technological progress was made in aerodynamics, propulsion, materials and principles of fuselage manufacturing, new weapons and aircraft equipment. The usage of radar was of particular importance. With the addition of turbojet engines, these aircraft achieve speeds in excess of twice the speed of sound ($M > 2$).

² The first generation of jet hunters whose missiles began to develop at the end of World War II and continued into the early postwar period.

They are especially distinguished by the fact that, in addition to cannons, they have IR homing missiles.³

The *third generation* is characterized by the emergence of aircraft flying at supersonic speeds, by further development of aeronautical weapons and by pulse radars. Semi-active homing was introduced as well as a possibility to shoot targets beyond visual contact via TV and electro-optical guided air-to-ground missiles and laser-guided bombs. The prestige of the third-generation fighter jets is the use of radars and long-range missiles. Guns and IR missiles were retained for close combat, which occurs if opponents survive at a distance. In addition to the aforementioned air-to-air weapons, these aircraft also carry air-to-ground missiles and support ground and naval forces very effectively. The third generation lasted until 1975.

The *fourth generation* lasted until 1995, characterized by further advancement of avionics, advent of Doppler radar, high maneuverability of aircraft, introduction of electrical flight control systems, advances in digital computers and the introduction of "launch and forget" weapons. The fourth-generation jet fighter is the concept of a 1970s fighter jet project, in the most massive operational use in air forces throughout the world from 1980 to 2015. The concept of the fourth generation of jet fighters is based on the assumption that superior flight performance, and in particular in the field of agility, is due to bring advantage in combat, both in attack and survival.

The fourth and a half or 4+ and 4++ generation⁴ gathers planes that have a reduced radar reflection but do not have all the

³ This generation of fighter jets belongs to a large number of types from countries that have their own development and production. Produced in an impressive number of copies, they have been involved in many local and regional conflicts, from the Vietnam War, the Gulf Crisis, the Civil War in the SFRY and others. They have been in operational use for a long time, and are still in use in some air forces. The most famous and significant are the F-4 phantom and the MiG-21, which have been used in all crises. In order to extend their life, they have undergone many modifications over the course of their long life. In the initial variants of the Phantom, the Americans overestimated the role of IR, so they threw out the cannon, and when they realized that it was fatal in close combat with the MiG-21 fighter, they returned it.

⁴ Significant progress has been made due to the dramatic improvement in capabilities with these upgrades of fighter jets and new projects in the last decade of the 20th century. Some of more modern aircraft of this generation stand out from the rest, so some countries have classified them as 4+ or 4.5. generation. They are mostly their own promotions, through an imprecise generation system.

“stealth”⁵ traits (Vlačić, 2008, p.7). The features of this generation of aircraft are the advancement of electronics and the flexibility to adopt new weapons. This generation lasted until 2010.

The *fifth generation*⁶ emphasizes the minimization of aircraft radar reflection, which requires, among other things, the placement of weapons within the fuselage instead on external weapon pylons. It is also characterized by the use of new high performance engines, vectored thrust engines, by high percentage of the use of composite materials in structure aircraft production to reduce weight, and by the application of modern computers for real-time control of aircraft systems. Airplanes of this generation have precise autonomously guided weapons, high flight performance, advanced features, high integration of equipment and computer systems, and the ability to network with other participants and segments of the "battlefield stage" in order to gain situational awareness (Vlačić, 2012). Currently, there is only one such 5th generation aircraft in operational use in the world. It is the American F-22 raptor, while the American F-35 Lighting II, the Russian Sukhoi PAK FA and the Chinese Chengdu J-20 are still under development. This generation is expected to last until 2025.

The *sixth generation* is to encompass future fighter jet projects. The first sixth-generation aircraft are expected to enter operational use between 2025 and 2030. Some US analysts speculate that their latest F-35 Lighting II, single-engine, multi-purpose stealth fighter jet, belongs to this generation. It is intended to dominate airspace, combat ground and sea targets, as well as to be used for reconnaissance, and will replace mid-range fighter jets currently in operational use in the US in the near future.

The dynamic development and technological advancement of national logistics in developed countries has made this development possible for aircraft.

⁵ Stealth feature implies difficult detection and monitoring of the aircraft by radar and other means, and is achieved by constructive reduction of the effective reflecting surface of the aircraft and the application of special materials and coatings for reduced reflection and absorption of radar signals.

⁶ The fifth generation jet fighter is a modern jet fighter based on advanced technologies developed in the first decades of the twenty-first century. This group of aircraft, as well as others, is determined by the classification of technically advanced countries. The criterion for accurately defining the characteristics of the fifth generation of jet fighters is more often controversial.



Figure 1 – Generations in fighter aircraft development (Tirpak, 2009, p.40)

Рис. 1 – Поколение в развитии боевых самолетов (Тирпак, 2009, p.40)

Слика 1 – Генерације у развоју борбених авиона (Тирпак, 2009, p.40)

Development of multipurpose fighter aircraft

Trends in the development of modern fighter jets in the world are leading towards upgrading multipurpose fighter jets; however, as long-term forecasts show, that will not be achieved in the first decades of this century. It seems that innovations in the future will focus on the development of assets such as drones, unmanned vehicles, and alike (Radić, 1995, p.7). These are aircraft based on a supersonic fighter jet, which is also the only means capable of fighting both airborne and ground targets. For a modern fighter aircraft, a large combat radius and the ability to survive in the enemy's sky is important. That is why radar visibility will be crucial for future fighter jets, although it is very difficult and expensive to create an aircraft with stult characteristics in all conditions.

The development of multipurpose fighter jets, in addition to increasing the operability of the aircraft itself, enables the unification of multiple purpose conceptions of the aircraft into one, i.e., enables the combination of the fight, assault and reconnaissance purpose in one aircraft. With this concept, significant savings are achieved during aircraft exploitation because reducing the number of different types of aircraft and unifying them reduces maintenance costs, facilitates the supply of spare parts, equipment and AO⁷.

However, independently developing and equipping air forces with modern multi-purpose fighter jets of recent generations is extremely expensive and is increasingly becoming a privilege for only the most developed nations such as the USA, Russian Federation and China. In many developed countries, increasingly complex technologies, pricing and budget constraints are leading to joint projects of military industries with military industries of other countries to divide costs. Examples include the cooperation of Germany, the United Kingdom, Spain and Italy in the design, development and production of the modern 4th generation multi-purpose airplane Eurofighter Typhoon (2019) and the cooperation of the British, German and Italian military industries in the design, development and production of the modern multi-purpose aircraft "Panavia Tornado". (Dudaš, 2000, p.12)

Also, national logistics of developed countries generally develop new fighter aircraft as combat platforms, which gives the opportunity to develop new aircraft based on the existing platform in order to modernize them. Huge costs of developing brand new aircraft are thus avoided.

⁷ Hereinafter, the term "aircraft ordnance" will be abbreviated AO, and for propellants the abbreviation is Pr.

Examples are numerous, such as the Russian Mi-8 helicopter. A number of new modern helicopters such as the Mi-17, the Mi-171 and others have been developed on this platform (Russian Helicopters, 2019). The MiG-29 aircraft platform gave rise to the MiG-29OVT, the MiG-33, the MiG-35 and others (Take-off, 2019). The platform of the US F-16 aircraft served as a basis for the F-CK-1 Ching Kuo, the T-50 Golden Eagle, the HiMMAT, and the F-2 Mitsubishi aircraft. (Lockheed Martin, 2019)

In recent years, national logistics of developed countries have made the biggest progress in the development and integration of electronic and computer systems for aircraft and avionics in general. The development of radars that have an antenna array with active electronic scanning is considered one of the most significant achievements in the history of radar development. These radars are more reliable, lighter and have longer range. They can operate in a number of different modes (air-to-air, air-to-ground) and allow monitoring and simultaneous action on multiple targets. The radar image generated by this radar is of very high resolution and allows the identification of terrestrial targets at distances greater than 100 km. (Vlačić, 2008, p.10)

Development of modern military aviation ordnance

The tendencies in the development of modern AO in the world are directed towards the development of smart AO of high precision and long range.

In terms of air-to-air and air-to-ground missiles, development is aimed at improving "launch and forget" missile systems, increasing range, increasing resistance to interference and known countermeasures, and at avoiding enemy missile defense systems. With regard to aircraft bombs, smart guided bombs are being developed and their precision, guidance and destructive power are being refined.

Today, many countries in the world mainly manufacture drones that can be of different sizes and uses. However, it is important to note that few such aircraft can be armed. Unmanned aerial vehicles⁸ belong mainly to middle UAVs or so-called small aircraft flying at altitudes of about 3000 to 9000 meters and can remain in the air from 20 hours to 60 hours. Such UAVs are usually powered by piston or turbojet engines that have modern electro-optical systems containing TV, thermal and IR

⁸ Such an aircraft is operated by a pilot not on the platform itself, but from the ground. Therefore, there is an interaction between the pilot and the aircraft in terms of providing input values for aerodynamic control surfaces and engine output and thrust, and there is no reference to the absence of the pilot in the control loop.

cameras, laser markers and range finders, as well as satellite navigation capabilities, data links, which can be controlled from medium to long range distances, and usually carry two to four ordnance assets for land and sea targets. (Vasiljević et al, 2017, pp.492-497)

National logistics today from the aspect of supporting the Air Force

Throughout its rich history, national logistics, i.e. military industry, has experienced difficult times. Its dynamic development was many times interrupted by war distructions, but despite all difficulties, it has found ways, with its capacities, quality personnel and development policy of the country, to carry out modernization so that today it is not lagging behind other world manufacturers of weapons and equipment. "For more than 100 years of its existence, the Serbian Air Force has used around 750 different types of aircraft in numbers of over 9,000, out of which 247 are the results of domestic design or production." (Development Agency of Serbia, 2015)

The nineties with their events represented a "dark period" for our entire society and for our military industry as well. Part of the capacities has been lost or destroyed, brain drain was massive, and the deep economic crisis and the isolation caused by sanctions led to a substantial technological delay compared to the modern world.

Aircraft and spares for military aircraft

Equipping the Serbian Armed Forces Air Force with indispensable modern multi-purpose fighter jets from domestic production is not possible today and it is unrealistic to expect it at this moment. That is why the focus in the Air Force will be on the import during this period, which does not mean that, in the future, the military industry will not develop programs for aircraft development, for which it has certain capacities.

Certainly, in the forthcoming period, domestic production will provide support to the Serbian Air Force with aircraft, which is reflected in equipping the Air Force with 15 domestically produced aircraft of the type "LASTA"⁹. In addition to equipping the Serbian Air Force, 20 of these aircraft were exported to Iraq.

⁹ "LASTA" aircraft, a product of the UTVA aircraft factory from Pančevo, is a modern lightweight training aircraft intended for selection, initial and basic pilot training and training in the basic elements of shooting, rocketry and bombing.

Equipping the Serbian Air Force continued with imports in 2016-2019. National logistics equipped the Air Force with two multi-purpose medium transport helicopters of the Mi-17V5 type of Russian production (Figure 2) during 2016. Also, for the Air Force, during June 2019, the Airbus H145M and Russian Mi-17 helicopters were procured. In the coming period, the Air Force is expected to be equipped with 7 more Mi 35 and Mi 17 helicopters of Russian production.

Equipping continued during 2017 with six aircraft from the Russian Federation to be modernized in the coming period. After modernization, they will be able to remain operational for an extended period of time. Also, equipping continued in 2018, to be part of the Air Force as early as 2019, where 4 aircraft were delivered as part of a donation from Belarus, while overhaul will be carried out at the Belarussian Overhaul Institute. (Ministry of Defense of the Republic of Serbia, 2016)



Figure 2 – Multi-purpose medium transport helicopter Mi-17V5 (Ministry of Defense of the Republic of Serbia, 2016)

Рис. 2 – Средний многоцелевой военно-транспортный вертолет Ми-17В5 (Ministry of Defense of the Republic of Serbia, 2016)

Слика 2 – Вишенаменски средњи транспортни хеликоптер Ми-17В5 (Ministry of Defence of the Republic of Serbia, 2016)

The absence of aircraft production under license and contracts for the production of spare parts for large foreign aircraft manufacturers is certainly something that national logistics lacks today; it impedes its more dynamic development which was always present in the earlier period of

its development.¹⁰ Technology and important practical and theoretical knowledge were transferred through these activities enabling our experts to develop quickly, become independent and make their logistics less dependent on foreign influences.

Possible prospects for developing national logistics in support of the Air Force

National logistics is recovering when it comes to supporting the Air Force. The system has been restarted. The production of domestic aircraft and aircraft parts has been restored and exports have started. Also, there is a renewed interest in the world's major military industries to collaborate with our military industry (Zrnić, 2019). All this is good and crucial to the survival and further development of our national logistics.

At this point, it is logical to ask a question: the first step is made, what next? It is not easy to give the right answer. In addition to a number of economic, technical, technological and other factors, the answer is also influenced by political factors. The relationships of our state with East and West determine the future direction of the development of our national logistics, and the quality and level of these relations dictate the speed and level that it will be able to reach in its development.

Following global trends, a long-term perspective in the further development of our national logistics is recognized in the grouping of military enterprises with predominantly state ownership into the group "Defense Industry of Serbia"¹¹ led by the Military Technical Institute (VTI), Žarkovo, as the developer and Jugimport SDPR as the promoter and marketer of the products. Such grouping can have advantages and provide for the consolidation and reconstruction of companies, reduction of development costs, higher capacity utilization, greater effect of investment in technology and production, and easier access to the world market.

¹⁰ In the SFRY, the *Gazela* helicopter was manufactured under the license of the French manufacturer Aérospatiale, and the company "Prva Petoletka", Trstenik, had a contract with the renowned aircraft manufacturer Boeing for whose needs it produced hydrocomponents and parts of the landing gear system.

¹¹ This group consists of the companies "Zastava Arms" from Kragujevac, "Krušik" from Valjevo, "Prvi partizan" from Užice, "Sloboda" from Čačak, "Milan Blagojević" from Lučani, "Prva iskra" from Barič. Also, in the future: companies "FAP" "Priboj", "Jumko" "Vranje", "Zastava trucks" "Kragujevac" and "UTVA" Pančevo.

On the state and prospects of the Serbian defense industry, a former Defense Minister, Zoran Djordjevic, told the Vecernje Novosti newspaper: "The Ministry of Defense has considered the state of production capacities, their competitiveness, as well as the future needs of the defense system for more modern means and production technologies. Accordingly, there are investments which the companies of the Defense Industry of Serbia are mostly independently realizing, so that in the coming period significant improvements and optimization of production capacities are expected, both for the existing production programs and for the development of new assets. The defense industry contributes significantly to the economic development of the Republic of Serbia and is currently the most dynamic branch of the industry, with the highest growth rate and enormous potential for its own growth, but also for initiating similar processes in the rest of the industry. Thus transformed companies in the consortium will be able to equip the Serbian Armed Forces as well as the world market with modern combat systems. (Večernje novosti, 2016)

Perspectives on military aircraft and spare parts

It is not realistic to expect the production of modern multi-purpose aircraft from national logistics at this time. However, this does not mean that this possibility should not be pursued in the future. On the contrary, as the production of modern multipurpose aircraft represents a pinnacle in the development of military industry, it should certainly be pursued in the long run.

There is a logical path to this end, and its beginning leads to the development and production of simpler aircraft types that have their place in the world market. Subsequently, by investing in technology and development, prospects should be open up through the production of more complex types of aircraft. In doing so, partners should be found to establish cooperation through joint development of new projects.

The professional staff that would support this development in our country could be provided by adequate staffing. It is concentrated in industry, the VTI Žarkovo, the Faculty of Mechanical and Electrical Engineering, units and institutions of the Air Force of the Republic of Serbia and other state and private companies and organizations. (Vujičić, 2015)

Thus, after the tests with the training aircraft LASTA, the factory UTVA Pančevo, or OIS, developed a new training/combat aircraft KOBAC. It is a trainer - fighter aircraft with a turbojet engine, a system for safe emergency escape and a modern integrated attack-navigation

system for observation and precise operation of various types of unguided and guided ordnance day and night. The aircraft has a wide range of uses including advanced training/combat use and combat use in close air support (Yugoipmort SDPR, 2019). In perspective, it could be a good export product (Figure 3).

Aircraft of this type are in demand in the world today. Almost all countries with aeronautical industries today tend to produce training/fighter aircraft. They are interesting for countries that have difficulties in controlling and monitoring their long state borders, and are being targeted by various terrorist and insurgent groups and organizations. In the near future, it can be expected to be part of the Air Forces of many countries, primarily Iraq, Algeria, Angola, and Uganda.



Figure 3 – Prototype of the KOBAC training/fighter aircraft (Yugoipmort SDPR, 2019)
Рис. 3 – Прототип учебно-боевого самолета „КОБАЦ“ (Yugoipmort SDPR, 2019)
Слика 3 – Прототип школско-борбеног авиона „КОБАЦ“ (Yugoipmort SDPR, 2019)

In any case, Kobac is a new success of the Serbian aviation industry - it will be the most technically and technologically advanced Serbian product that can pull the civil industry forward as well. „Let's not forget that, when conquering the production of the Eagle aircraft more than 40 years ago, we introduced machines with numerical control for the first time, that we conquered the production of plexiglass as well as the technology of chemical milling of metals. It is important that Serbia's aviation industry is not shut down, that new aircraft are designed and built. We export aircraft, not just raspberries...” (Lazanski, 2012)

Another chance of developing national logistics in support of the Air Force is in the production of drones. Unmanned aerial vehicles are nowadays probably one of the most current world trends in aviation development. In recent years, they have become one of the symbols of the new generation of wars and are in the armed forces of all countries of the world. Originally developed for reconnaissance tasks, today they are increasingly becoming platforms for actions on ground targets.

At the moment, national logistics has the capacity to develop and produce this type of aircraft. OIS developed and produced a prototype of the Air Force's interesting, tactical long-range unmanned aerial vehicle "PEGAZ" (Figure 4).



Figure 4 – Tactical unmanned aerial vehicle 'PEGAZ' (Dragović, 2016)
Рис. 4 – Тактический беспилотный летательный аппарат «ПЕГАЗ»
Слика 4 – Тактичка беспилотна летелица великог долета „ПЕГАЗ“
(Dragović, 2016)

It was originally developed as a reconnaissance platform, but in line with world trends, its development also included the ability to execute actions on ground targets. In addition to equipping the Air Force, this drone can also be a good potential for export.

A great deal of attention is being paid in the world to the modernization of existing aircraft. This process is less expensive than acquiring new aircraft, bringing technologically outdated aircraft closer to the level of new aircraft. Of course, modernization cannot completely replace the acquisition of new aircraft, but the cost-benefit ratio is

certainly worth it. It is restricted to expired aircraft and to aircraft for which it is possible to extend it.

Prospects for the development of national logistics in this regard are in the modernization of, above all, the G-4 Super Galeb aircraft and the ORAO as the largest group in the Air Force.

Modernization of the G-4 Super Galeb aircraft was initiated through the G-4 MD (modernized-digitized) project with the aim of obtaining a modern aircraft that will provide quality training for the transition of pilots to some future multi-purpose fighter aircraft and be trained for action by modern air-to-air and air-to-ground combat vehicles. (Dragović, 2016)

Also, the modernization of the ORAO aircraft is planned through the installation of avionics¹² which will represent the next generation in the category of functional aircraft.

A significant acceleration of development can also be brought about by the licensed production of possible foreign aircraft or some segments of aircraft construction, which was always present during the earlier development of national logistics. In this way, technology transfer is achieved and valuable knowledge and practical experience are gained. However, due to the situation in national logistics, it is difficult to count on this activity during this period, but it should definitely be pursued. For the beginning, it is likely to be in the production of technologically less complex aircraft or aircraft construction segments such as training and combat aircraft.

The prospect of developing national logistics in support of the Air Force should also be sought in cooperation and joint projects of aircraft with foreign partners. These activities provide faster development, lower costs and benefits in joint appearance on the market.

Aircraft repair jobs are certainly the most interesting and easily achievable way for developing our national logistics in support of the Air Force and a realistic long-term prospect that needs to be recognized. There are overhaul capacities, there is professional staff and tradition in this business. Therefore, it does not start from scratch - the essence for further development exists. It should be emphasized that the capacity level is not satisfactory at this time. It is necessary to renew missing infrastructure capacities, to purchase some new equipment and to fill the Aviation Institute "Moma Stanojlovic" with the missing expert staff

¹² The term avionics means all aircraft equipment, primarily instruments, electrical and electronic equipment.

existing in our market¹³. The need for investment is not too great in relation to the profits that can be made in the long term, not only in support of our Air Force, but also in financial gain through participation in the world market. The acknowledgment of this is the recognition of the potential of our national logistics when it comes to aircraft overhaul by major global companies.

Confirmation of this is the visit of the delegation of the Russian Helicopters Company in 2015 which on that occasion expressed interest in opening a regional center for the overhaul of Russian-made helicopters at the Aviation Institute "Moma Stanojlovic". As Russian-made helicopters are widely present throughout the world and our country, and the Institute has extensive experience in overhauling these helicopters, such an arrangement would in the long run ensure a secure job for the Institute on the international market, and thereby raise quality and provide more reliable support to the Air Force. (Galović, 2016)

The strategic partnership between the Government of the Republic of Serbia and the European company Airbus Group is of great importance for the development of the defense industry. This international company is interested in existing overhaul facilities with the idea of opening a regional helicopter overhaul center "GAZELA" (Galović, 2016). In addition to overhaul capacities, this European company is also interested in equipping the Air Force with new aircraft as well as in modernizing the existing ones, in terms of enhancing the capacity of our aviation industry, as the high level Memorandum of Understanding signed between the Government of the Republic of Serbia and the Airbus Group stipulates. In addition, regarding its functionality and modernization, the Ministry of Interior's helicopter units will use Super Puma H-215 medium transport helicopters, manufactured by the Airbus Group.

To develop national logistics, the best option would be to open both of these centers. The significance would be twofold. First, support for the Air Force through overhaul would be more comprehensive given that the Air Force is equipped with Russian-made Mi-8 and Mi-17 helicopters and Western-made GAZELA helicopters. Also, overhaul of these helicopters would certainly mean easier and cheaper access to spare parts for these types of helicopters. Second, overhaul service could be offered for a wider range of different types of helicopters and would provide access to

¹³ Aeronautical personnel in our country are educated at the Military High School, the Military Academy, the Mechanical Engineering, the Faculty of Transport and Electrical Engineering, and the Petar Drapšin Air Force Academy, Belgrade.

both the Eastern and Western markets. This perspective is certainly a largely political issue. The answer to this question is related to the future direction of the state policy of the Republic of Serbia and its relation to the East and the West. It should be answered by our political elite.

When discussing aircraft overhaul, particular attention should be paid to the overhaul of the MiG-29 aircraft. At present, the Air Force has 10 aircraft of this type, and this donation from the Russian Federation creates conditions for better defense of the airspace of the Republic of Serbia (Radio Television of Serbia, 2016). It also shows the Air Force's longer-term commitment to choosing a multi-purpose fighter aircraft for its units.

To conquer overhaul, it is necessary to invest in infrastructure, test equipment and technology transfer. Although the Moma Stanojlovic Aviation Institute and the 204th Aviation Brigade have extensive experience in the operational maintenance and implementation of certain simpler phases of overhaul of these aircraft, given the small number of aircraft, the big question is the economic justification for winning the overhaul of this aircraft.¹⁴

In terms of operational capabilities of the Air Force, it is more important to win overhaul of spare parts for this type of aircraft. This would ensure greater utilization of the approved inter-overhaul resource, greater autonomy and greater stability in the supply of spare parts. Also, since overhaul prices of these spare parts are very high¹⁵ it would also provide significant financial savings. On the other hand, due to technological complexity, it is not economically justifiable to win overhaul of all aircraft devices and assemblies, but it should certainly strive to adopt overhaul for all devices and assemblies for which it is economically justified.

The prospects for manufacturing aircraft spare parts are reflected in the penetration to the global market and in the production of spare parts for large global companies. Such contracts are certainly not easy to win, but there are some interests expressed. For example, in September 2015, representatives of the European company Airbus Group held a conference called Airbus Group - Suppliers Day in the Serbian Chamber

¹⁴ During the overhaul of the MiG-29 aircraft, carried out in 2008 and 2010, the stages of dismantling and assembly of parts and assemblies were carried out by the personnel of the Moma Stanojlovic Aviation Institute and the 204th Aviation Brigade, and their repair was carried out in the Russian Federation.

¹⁵ The contract for the repair of spare parts for the MiG-29 was concluded with OAO "558. Aviatonnyy remontnyj zavod" from Belarus in 2015

of Commerce in order to find suppliers of parts for their products in our country.

Prospects for the repair of spare parts probably need to be sought and developed as part of the development of the overhaul of aircraft as a whole for the types of aircraft that will be overhauled in our country to complete the process.

Prospects for aeronautical ordnance

Prospects for the development of national logistics in the Air Force support segment with AO are in the development of new modern AO types and the overhaul and modernization of the existing ones. For these activities, there is professional staff with the necessary experience.

For the development of new AO, prospects are reflected in the development of high-precision guided AO, independently and in collaboration with foreign partners. An example is the most ambitious development project of the domestic military industry in technical and technological terms, the ALAS rocket system developed by the domestic private company Edepro with the support of Jugoimport-SDPR (Figure 5).



Figure 5 – ALAS rocket system (Radio Television of Serbia, 2013)
Рис. 5 – Ракетная система „АЛАС“ (Radio Television of Serbia, 2013)
Слика 5 – Ракетни систем „АЛАС“ (Radio Television of Serbia, 2013)

It is a long-range multipurpose guided missile system, in which the guidance is achieved without a direct visual contact with the target. The peculiarity of this rocket system is that it is not intended to be used on only one type of a platform, but it can be used on different types of fighter platforms such as stationary launchers, combat vehicles, aircraft, ships,

and the like. It is designed to perform actions on a wide variety of targets such as armored vehicles, established infrastructure, ships, low-flying helicopters and more. (Radio Television of Serbia, 2013)

The overhaul and modernization of AO represents a significant prospect for the development of our national logistics in support of the Air Force, aimed at improving the quality of the existing AO.

In addition to supporting the Air Force, more effective use requires modernization of AO, which would certainly be of general interest to the Air Force because it is less expensive than acquiring new assets, and most Air Forces owns certain quantities of older AO types that are technologically outdated and need to be modernized.

Conclusion

Prospects of the development of national logistics in support of the Air Force of the Serbian Armed Forces, among others, are significantly shaped by political factors. In what direction and how fast it will develop depends on the relations of the Republic of Serbia with East and West. The military neutrality and balanced policy of the Republic of Serbia towards the great powers of the world could have a favorable impact and help it in its faster and better development.

Following the trends in the world, one of the long-term prospects in the further development of our national logistics is recognized in the grouping of state-owned enterprises of the military industry into the Defense Industry of Serbia Group, which, through joint development and appearance on the market, will certainly ensure their better and a more secure future (Radić & Radić, 2018, pp.162-179).

Development prospects should also be sought in cooperation and joint projects with foreign partners. These activities provide faster development, lower costs and benefits in joint appearance on the market.

Long-term prospects for the development of our national logistics, at this point, should not be sought in the production of modern multi-purpose aircraft. The current level of technological development of our military industry does not allow such a thing at the moment. This end goal should be pursued in the long term, and the path to it leads through the development and production of technologically less complex aircraft through which our national logistics will slowly strengthen, adopt new technologies and gain the necessary experience as a basis for progress towards the end goal.

The production of drones, as one of the most current trends in the development of aviation today in the world, certainly has a perspective here, and is an important direction for the development of our national logistics and a potential export resource. As our national logistics currently has the capacity to develop and manufacture this type of aircraft, this prospect makes it even more significant.

A great deal of attention is being paid in the world to the modernization of existing aircraft. It renders technologically obsolete aircraft current. Of course, modernization, because of its limitations, cannot completely replace the procurement of new aircraft, but it can "buy" the time necessary to create the conditions for the procurement of new aircraft and such costs are significantly lower than the procurement costs.

A real long-term prospect and the most interesting and easily achievable path to develop our national logistics in support of the Air Force is certainly to focus on aircraft repair jobs. Overhaul capacities, professional staff and tradition in this business exist, and their potentials have been recognized by major global companies.

Prospects in the production of aircraft spare parts should be sought in penetrating the global market and in producing spare parts for large global companies. Such contracts are certainly not easy to win, but there are interests.

When it comes to overhaul of spare parts, the prospects of our national logistics in supporting the Air Force should be sought and developed in overhaul of spare parts for the MiG-29 and for the types of aircraft that will be overhauled in Serbia to complete the entire process.

Prospects of support regarding AO are in the development of new modern high precision AO types, independently and in cooperation with foreign partners, and overhaul and modernization of the existing AO. For these activities, there is a professional staff with extensive experience. In addition to supporting our Air Force, modernizing existing AO could also be an interesting export service.

Based on the above, it can be concluded that there are prospects for the development of national logistics in support of the Air Force. Some are easier to realize and are clearly offered to us and some are more difficult and require longer time and greater investment. Which ones need to be developed and which ones will pave the way for the long-term development of our national logistics in support of the Air Force must be recognized and decided by the political elite of our society.

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РАЗВИТИЕ НАЦИОНАЛЬНОЙ ЛОГИСТИКИ, ПОДДЕРЖИВАЮЩЕЙ ВОЕННО-ВОЗДУШНЫЕ СИЛЫ РЕСПУБЛИКИ СЕРБИЯ – ДОЛГОСРОЧНЫЕ ПЕРСПЕКТИВЫ

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РУБРИКА ГРНТИ: 78.21.53 Исследования и разработки в области
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78.25.13 Военная авиационная техника и вооружение
ВИД СТАТЬИ: профессиональная статья
ЯЗЫК СТАТЬИ: английский

Резюме:

Введение/цель: Военная авиация осуществляет свои задачи в воздушном пространстве, поэтому ей необходимо использовать спецоборудование и вооружение, которые в свою очередь делают ее особо техническим видом вооруженных сил. Данная техническая подоплека указывает на важность логистики для Военно-воздушных сил. Национальная логистика оказывает постоянную поддержку Военно-воздушным силам Республики Сербия, в том числе посредством различных отраслей промышленности. В первую очередь задействована оборонная промышленность, занимающаяся производством и сбытом боевых средств и военного оборудования.

Методы: В данной работе применялся метод анализа мировых тенденций развития современных авиационных средств и спецтехники, а также метод синтеза, с помощью которого представлено состояние национальной логистики на сегодняшний день, а также возможности поддержки Военно-воздушным силам Республики Сербия, посредством своих основных источников.

Результаты: Рассмотрены основные источники и возможные перспективы дальнейшего развития национальной логистики с упором на модернизацию самолетов и иной спецтехники, на подготовку кадров и повышение уровня жизни военнослужащих, а также на разработку и развитие совместных проектов с зарубежными партнерами.

Выводы: Значимость статьи заключается в выявлении перспектив развития, которые могли бы значительно повлиять на дальнейшую направленность национальной логистики на оказание поддержки Военно-воздушным силам Республики Сербия.

Ключевые слова: Вооруженные силы Республики Сербия, авиация, логистика, вооружение, военное оборудование, состояние и перспективы.

РАЗВОЈ НАЦИОНАЛНЕ ЛОГИСТИКЕ У ПОДРШЦИ РАТНОМ
ВАЗДУХОПЛОВСТВУ ВОЈСКЕ СРБИЈЕ – ДУГОРОЧНЕ
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ОБЛАСТ: ратно ваздухопловство, логистика
 ВРСТА ЧЛАНКА: стручни чланак
 ЈЕЗИК ЧЛАНКА: енглески

Сажетак:

Увод/сврха: Ратно ваздухопловство реализује своје задатке у ваздушном простору, па мора да користи специјалну опрему и наоружање, што га чини изразито техничким делом овог вида у којем логистика има важно место. Национална логистика пружа подршку Ратном ваздухопловству Војске Србије, поред осталог, кроз различите гране и делове индустрије. То чини, превасходно, кроз наменску индустрију – делом индустрије који се бави производњом и прометом наоружања и војне опреме.

Метод: У раду се користи метода анализе, којом су испитиване тенденције развоја савремених ваздухопловних средстава и наменских индустрија у свету, као и метода синтезе, којом се сагледава стање националне логистике данас и могућности подршке Ратном ваздухопловству Војске Србије кроз њене основне изворе.

Резултати: Сагледани су основни извори и могуће перспективе даљег развоја националне логистике, са тежиштем на модернизацији ВУБС-а (увођење нових летелица и друге опреме, обука људства, као и побољшање животног стандарда припадника Војске), те развоју и сарадњи на заједничким пројектима са иностраним партнерима.

Закључак: Потребно је у значајној мери тежити стварању услова за дугорочну перспективу развоја националне логистике у подршци Ратном ваздухопловству Војске Србије.

Кључне речи: ваздухопловство, Војска Србије, логистика, наоружање, војна опрема, стање и перспективе.

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