UDK: 623:56.621.453 PALIGORIC A.
COSATI: 19-06

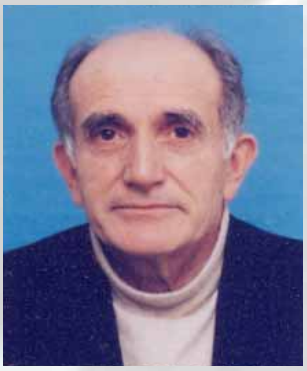
In Memoriam

ANASTAS PALIGORIĆ –Artillery Design Legend

Miomir Kalezić[1)]

ANASTAS PALIGORIĆ died in mid 2017. He was the greatest modern chief designer and project manager in the majority of fire support artillery weapons development projects. During his successful engineering carrier he has created a considerable number of mortars, towed and self-propelled artillery weapons in calibers from 60 mm to 155 mm. Many of these systems are still attractive on the world market. His designer's genius found its substantiation in the optimization of the systems having in mind the interactive relationship between the user, the designer and the manufacturer.

Key words: **Anastas Paligorić, artillery system, artillery weapon, WME design, mortar, gun, howitzer, self-propelled artillery, 60 mm caliber, 100 mm caliber, 105 mm caliber, 120 mm caliber, 130 mm caliber, 152 mm caliber, 155 mm caliber.**



ANASTAS PALIGORIĆ was born in 1938, in Bitola, Macedonia, YUGOSLAVIA. He died in June 2017 in Belgrade, SERBIA.

He graduated from high school in Kragujevac (SERBIA) at the top of his class.

As a military scholar, he graduated at the Faculty of Mechanical Engineering, University of Belgrade, at the Department of Military Mechanical Engineering. His thesis on weapons engineering and design set him down the path of following the footsteps of his professor Boško Stanisavljević, the doyen in the field of artillery systems design and development in former Yugoslavia.

After being promoted to the rank of technical service lieutenant, he was assigned to the BRATSTVO Company in Novi Travnik (BOSNIA and HERZEGOVINA) where he had matured from the beginner designer into an engineer familiar with the technological and manufacturing problems in artillery weapons production. The factory at that time had, among other projects, carried out the production of 120 mm UB M52 mortar, 76 mm M48 mountain gun and 105 mm M56 towed howitzer, as well as the development of 155 mm M65 towed howitzer (based on the American design of 155 mm M1 weapon), so he had a lot of opportunities to get to know the practical aspects of applied design solutions and corresponding manufacturing technologies.

After almost two years spent in the factory, he has returned to Belgrade and started working in the Weapons Research and Development Institute (later known as the Military Technical Institute – VTI) where he launched a brilliant career as an artillery weapons designer and constructor, proving to be a worthy successor to his mentor and teacher, professor Stanisavljević.

With his participation in the project of modernization of 105 mm M56 howitzer and the development of 85 mm naval gun for the armoured river boat, he drew the attention of his superiors and was sent to Paris for master studies at the National Weaponry Academy (*Ecole Nationale Supérieure de l'Armement- ENSAR*). In early seventies of the past century he returned from his studies and joined the project of developing new 81/82 mm and 120 mm mortars. He became a team leader on the project of developing 120 mm mortar, according to the technical specification and tactical requirements defining the need of equipping the army with two types of weaponry: infantry weapon, with greater mass (marked M75 upon entering the service), and the light type weapon, with the reduced mass (marked M74).

Figure 1. Mortars 120 mm: M74 (top) and M75 (bottom)

[1] Correspondence to: Miomir Kalezić; e-mail: vukalezic@yahoo.com

Since knowledge, expertise and organizational skills of Anastas Paligorić were crucial in making all the weapon systems that he had worked on top of the range, given their tactical performances and combat-service characteristics, this article will focus on illustrating main features of these systems.

The 120 mm M75 mortar is the infantry's main close range fire support weapon. Mortar is transported on a wheeled carriage and has a total mass of 263 kg. Its mass at the firing position is 177 kg. Ballistic design of its 1690 mm long barrel (including breech ring) provides a 6340 m range (using a light explosive shell), i.e. 5551 m (using a heavy high explosive shell). Its range attained 9050 m when using rocket assisted high explosive shell.

Late eighties saw the beginning of development of an elongated, aerodynamically optimized shell with the range of 7200 m.

M74 version weighed 120 kg at the firing position and had a range of 6213 m with a standard high explosive shell.

By keeping it compatible with the international designs of similar weapons and suitable for use with all the available 120 mm shells with working pressure under 1000 bar, a system was created, still up to date nowadays and successfully selling at the world market. As a recognition of his contribution to the development of high performance mortar weapons, Anastas Paligorić was awarded the "December 22nd" state prize as a leader of the development project team. His professional role in the process of sighting devices development and shells improvement should also not be overlooked, since those were crucial for the success and the overall quality of the system which, upon entering the service, significantly improved infantry's fighting capabilities. Events which occurred during the weapon final testing stand out as a curiosity worth mentioning. Namely, the tactical and technical specification and requirements demanded for the weapon to be able to fire on a soft soil, asphalt and concrete. During the final firing tests, the concrete platform in a firing position broke. The proving ground facility was forced to make a new, reinforced platform, so during the second firing test, weapon's supporting leg spades got deformed. By optimizing and reinforcing the spades, one of a 120 mm mortar design kind was created with virtually no limitations in terms of choosing the firing position ground.

After the development of 120 mm mortar, during the serial production of 60 mm, 81 mm, 82 mm and 120 mm mortars, immesurable was the help Paligorić provided to his associates and his role in solving technical and technological problems in reaching the required level of quality.

Figure 2. Towed howitzer 122 mm D-30

Anastas Paligorić took the active part in the Yugoslav People's Army artillery modernization programme adopted in 1975. According to that programme, the troops were to be equipped with new ordnances in order to increase the fire power through the right selection and structure of calibers, the number of different calibers in the fire support system was to be reduced (105 mm caliber was supposed to be replaced by the 122 mm weapons in all military units up to the division level, and 130 mm and 152 mm calibers were to be used in higher level units), as well as 122 mm and 152 mm self-propelled weapons were to be introduced in mechanized units.

Project realization began with the purchase of a license for the own production of the Russian made 122 mm D-30 towed howitzer and its ammunition, and the purchase of a certain quantity of 122 mm 2C1 (GVOZDIKA) self-propelled howitzers and 152 mm D-20 towed guns.

The process of mastering the production of D-30 howitzer meant, apart from conforming to the local standards and available level of technology, making improvements to reach even better performances of an already supreme weapon on an international scale (concept-wise - tripod carriage; construction - wise - low weight, compact design, low height line of fire). Instead of multi-chambered muzzle brake producing severe shock wave and blast overpressure at crew positions, a new cast double baffle high efficiency muzzle brake was designed and developed, significantly reducing the negative impact on the crew. The existing threaded spindle jack for suspension at the firing position was replaced by the hydraulic assembly, which accelerated the procedure of setting the weapon into firing position. Apart from these main improvements, a series of changes was made thus contributing to the technological advantages of the domestic design which was marked as D-30J.

Even though the managing role in this modernization project was given to Radmila Jovanović, issues related to the design concept, analysis of their impact on the performances and combat use of the weapon, as well as defining boundary conditions for the design optimization were, as a rule, based on the knowledge, expertise and skills of Anastas Paligorić, who had an innate ability to generously point his associates into the right direction and entrust them with the clearly defined responsibility granting them right to their own success and credits.

The weapon improvement process paralleled the mastering of the production of standard high explosive and shaped charge projectiles, as well as the development of new M76 increased range projectile (17130 m). During this process A. Paligorić was consulted on a regular basis regarding the integration of the new M76 round into the domestic 122 mm D-30J weapon system.

Figure 3. Towed anti-tank gun 100 mm TOPAZ

Understanding the need of a country with limited financial resources for a quick and efficient way of equipping its armed forces with minimum expenses, A. Paligorić launched the development of two new weapons using parts of the carriage from the existing 122 mm D-30J as a base. Guided by the knowledge and experience he had gained, he made all the necessary calculations, defined the design concept and drafted

required programme and planning documentation for the development of a 100 mm towed anti-tank gun TOPAZ and a 100 mm stationary coastal gun TON. Živorad Milenković (later Srboljub Ilić) and Radmila Jovanović led those projects. There was, of course, a continuous cooperation and coordination of the project activities with Anastas Paligorić, the initiator and mentor whose ever-present inventor's spirit inspired the project throughout its entire realization.

The anti-tank TOPAZ gun was created by mounting a smooth bore barrel from a towed Russian made 100 mm T-12M (2A19-M) onto a D-30J 122 mm howitzer carriage, fully preserving the ballistic design and hence the possibility of using the existing T-12 gun ammunition. That enabled: easy and quick setting up and switching of firing positions; 360^0 firing arc in traverse; quick shifting of firing arc for the transfer of fire to new targets; performing fire support tasks at ranges up to 8200 m; increased mobility of a towed vehicle with a gun (due to a shorter overall length of the weapon compared to T-12 gun) achieved by folding the carriage trails and positioning the barrel over the fixed trail); easier tracking of moving the targets (as the gunner's seat is mounted on the upper carriage). Another special combat feature of this new towed anti-tank gun was a world's unique (at that time) opto-electronic fire control system with day and night sighting device and laser range finder ensuring high first round hit probability at the moving and stationary targets.

Figure 4. Stationary coastal gun 100 mm TON

The 100 mm TON coastal gun was created by mounting a T-55 tank grooved barrel instead of the existing D-30J howitzer barrel. The upper carriage was fixed onto the special support structure fixed inside the seacoast artillery units dugouts. It has kept the ability of not limiting the firing arc in traverse, while gun laying in elevation is limited to 45^0. The gun uses all types of ammunition from T-55 combat set. Installation of an electro-mechanic loader made 15 rounds per minute rate of fire possible.

While the gun proved to be capable of receiving integration of the existing SUVOA M70 coastal artillery fire control system, the development of a new, modern and more powerful system, was later, unfortunately discontinued by the lack of funding.

Radmila Jovanović, as the project manager, received the "December 22nd" state prize for the successful development of the TON coastal gun.

Golden era and the time of intensive development of artillery weapons at the Military Technical Institute, driven and masterminded by no one other than Anastas Paligorić,continued with the work on NORA weapon system (Serbian acronym for Novo Oruđe Artiljerije - *New Artillery Weapon*). By accurately judging the role of classical artillery in the system of land forces and predicting trends in its development, in 1976 A. Paligorić initiated the modernization of previously acquired 152 mm D-20 Russian gun.

Figure 5. Gun-howitzer 152 mm M84 - option with projectile rammer

He had two major goals in mind: increasing firing range from 17 km to 24 km; and increasing fire and manoeuvre capability so as to enable the performance of tasks typical for howitzers by increasing the field of action in elevation (from 450 to 630). A 40 caliber barrel (with 18 dm^3 powder chamber volume) was designed and mounted on the basic solution, a new projectile with optimized ogival and boat tail (M84) was designed and the production of new propellant charges arrangement in a brass cartridge case was mastered – all under his guidance. All of these project requirements were realized, and the system entered the service as 152 mm M84 gun howitzer. The system ranked with the world's best solutions – the American 155 mm M198 navy howitzer and the Russian 152 mm MSTA-B (2A65) weapon. In honor of his contribution in a successfully completed development, Anastas Paligorić was once again awarded the highest national recognition - the "December 22nd" state prize.

During the 1983 cooperation with a foreign company, initiated by Anastas Paligorić, was launched. Being aware that the future of artillery lies in high fire power systems with firing ranges of up to 40 kilometers, he conducted and successfully completed negotiations that led to a qualitative leap in the domestic defense industry development and a significant progress in numerous fields concerning weaponry, projectiles and propellant charges. Anticipating, in a visionary manner, possibilities and undisputed benefits from the professional cooperation with a foreign partner, he succeeded in obtaining contracts and acquiring design and technological documentation for: ERFB 155 mm projectiles (Extended Range Full Bore - elongated projectile with nubs in the frontal area for alignment inside the barrel), ERFB-BT (Extended Range Full Bore - Boat Tail - elongated projectile with nubs and boat tail), ERFB-BB (Extended Range Full Bore - Base Bleed - elongated projectile with nubs and base bleed); the base bleed unit for increasing the range of artillery projectiles;

and M2 and M11 propellant charges made from double-base, multi channel grain powder.

Figure 6. 155 mm M46/84 converted gun

As a part of cooperation with a foreign partner, a 155 mm M46/84 converted gun was developed by mounting a 45 caliber length barrel on a Russian 130 mm M46 gun carriage. By using an ERFB-BB projectile, the range of 39 kilometers was achieved, which was 45% longer than the range of M46 gun. With an increase in target efficiency by more than three times, the product that will keep its appeal over a long period of time for a number of customers worldwide, was created. Soon after that, a 152 mm caliber version (152 mm M46/86 converted gun) was developed through a project managed by Miomir Kalezić (in cooperation with A. Paligorić). We were one of the world's first designers to master a ballistic system with a 45 caliber long barrel and a 23 dm^3 powder chamber and the first to offer to foreign markets the conversion of 130 mm M46 gun into 152 mm and 155 mm calibers.

That ballistic system later became a basis for continuing work on the NORA weapon system as a part of an approved support artillery modernization programme.

NORA artillery system development project comprised three different versions of the weapon:

- Towed (NORA-A);
- Self-propelled (NORA-B); and
- Weapon with auxiliary propulsion unit (NORA-C).

Figure 7. Concept demonstrator of the 152 mm NORA-C1 weapon with auxiliary propulsion unit

Following the reasonable logic that the development of complex systems has to be carried out by conducting a research and gradually developing its key subsystems, A. Paligorić launched the development of NORA-C - weapon with an auxiliary propulsion unit using a prototype of NORA-A - the towed version. He entrusted his associate Miomir Kalezić with that task and employed domestic institutes to develop drive and electro-hydraulic servo systems to mechanize the features at the firing position. NORA-C1 concept demonstrator (functional model) was used for checking the drive concept (high torque hydraulic motors in weapon's wheels) and motion control (by hydraulic motors and by auxiliary wheels swiveling). Concept designs of electro hydraulic projectile and propellant charge rammer and servo system for barrel laying in elevation were also tested.

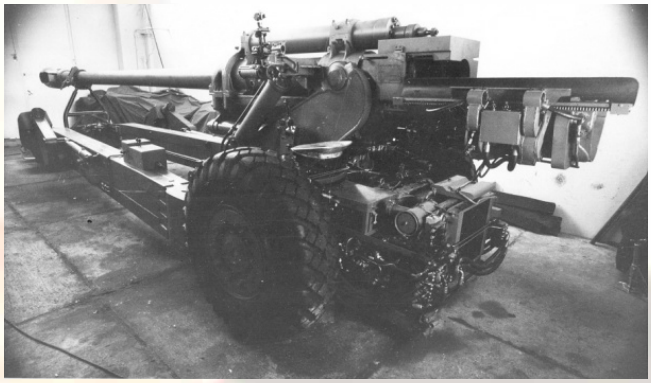


Figure 8. 152 mm NORA-C2 prototype weapon with auxiliary propulsion unit

Manufacturing of the NORA-C2 prototype weapon with auxiliary power unit began during 1987. A 152 mm 46 caliber length barrel with the ability of 180^0 rotation, which folded over the carriage trails in transfer and traveling position, was mounted on a carriage designed to withstand the larger caliber weapon (at that time, the possibility of developing 203 mm caliber weapon for ranges up to 50 kilometers was also considered). Propulsion unit with diesel engine is mounted in the front section of the lower carriage, and locally manufactured hydraulic motors are built into the main wheels with hydro pneumatic suspension. All the operations during the deploying of the weapon at the firing position and all the functions during firing were automated, including the loading of ammunition into the barrel and barrel laying in traverse and elevation.

Due to the lack of funding in the military budget, the development of NORA-C weapon was cancelled in 1989.

The initial preliminary document for the development of a self-propelled gun howitzer considered three possible design concepts: turret mounted armament on M84 main battle tank chassis; turret mounted armament on a new 8x8 wheel arrangement chassis; and open mounted ordnance on an off road vehicle platform with 8x8 wheel arrangement. A feasibility study showed that the open mounted concept on the truck chassis would be the most acceptable solution from the cost/effectiveness point of view. Rightly anticipating the trends of possible fire support artillery development, A. Paligorić suggested that development should be launched by manufacturing a functional model of NORA-B weapon with an open mounted armament components moving in traverse of the NORA-C2 version prototype (including barrel assembly, cradle, recoil system, semi automatic projectile rammer, upper carriage, barrel laying mechanisms and hydro pneumatic storage accumulators) on the FAP 2832 (8x8) truck chassis of the Serbian production, with four trails as a support at the firing position and with a rear firing arc (in respect of the cabin position and the truck driving direction). That way A. Paligoric, as a head designer, became the first in the world to implement the TMG concept (Truck Mounted Gun) which today is accepted by a dozen countries as an optimum solution for equipping mechanized artillery units. Managing role in performing this task was given to Novak Mitrović, one of his associates.

Weapon functional model was tested at the end of 1990. During 1991 all the shortcomings identified during the previous testing were solved, and the first version of the powder chamber sealing system for ammunition without metal case was tested. Unfortunately, just like in case of

NORA-C, the further development of NORA-B weapon was also aborted due to the lack of funding.

Figure 9. Functional model of the 152 mm NORA-B truck-mounted weapon: travelling configuration (top) and combat position (bottom)

A. Paligorić's engagement in the development projects and in mastering the manufacturing process of armed turrets for M84 tank and infantry fighting vehicle BVP (BVP M-80 and VIDRA) is certainly worth mentioning here. His guidance and his professional help to the project team in resolving technical-technological issues, defining concepts and considering questions related to the integration of armament during the development, always led to the optimization and rationalization of designs and achieving maximum tactical – technical features in given development and manufacturing conditions. Equally, his striving to launch the development of a tank destroyer mounted on a lightened M84 tank chassis possessing the same fire power and better maneuverability compared to the mechanized formations which would escort, protect and support, represents one of his visionary ideas. Unfortunately, it appeared at the time when Yugoslavia was facing numerous difficulties and limitations, and never got further than the preliminary project analysis and studies.

During the 1990, already a colonel for a number of years, Anastas Paligorić left the Military Technical Institute and became the director of the Marketing Department at the Federal Directorate of Supply and Procurement. By the end of 1994 he retires from the position of acting director of the Federal Directorate of Supply and Procurement meanwhile transformed into the state owned company Yugoimport – SDPR (YI – SDPR).

Given that the concept of the self-propelled weapons with open mounted armament (with no turret) began to assume its well deserved position in the world market, and with potential customers in sight, the development of NORA-B system was revived in YI-SDPR in 2003, and A. Paligorić was appointed a head of the project. The existing functional model implemented at Military Technical Institute was used as a basis for performing adjustments needed for the demonstration of the weapon to the foreign buyer, and then the manufacture of a prototype with a 52 caliber length barrel began. Development, manufacturing and delivery of the first batch of 155 mm NORA-B52 weapon (our first fourth generation artillery weapon system) was completed within the five year period, above all thanks to professional and organizational skills of Anastas Paligorić.

Figure 10. Prototype of the 155 mm NB-52 gun-howitzer: travelling configuration (top), combat configuration (bottom)

By making significant changes in the design, while completely preserving the design concept applied on the concept demonstrator of the weapon, a new, more powerful system with a range of over 41 kilometers (using the largest propellant charge and an ERFB-BB type projectile) was designed.

Armament with the field of action in elevation of -5° to +65° (in the basic firing arc, opposite the vehicle cabin), and +25° to +65° (in the auxiliary firing arc respectively, above the vehicle's cabin) is mounted on a rotating platform support situated on a platform attached to the 8x8 vehicle chassis. While the field of action in traverse was 60° in the basic firing arc, in the auxiliary firing arc it was 50°. Short firing bursts of 3 to 12 rounds, depending on the tactical situation, were enabled by installing automatic (electro hydraulic) projectile and propellant charges loader on a revolving platform (container with 12 projectiles is located to the left of the cradle, and a container with 12 propellant charges is located to the right of the cradle).The additional 24 rounds are located in special containers behind the vehicle's cabin.

During the firing, the platform leans against the ground with semi-elastic trails and self digging hydraulic legs. Commander and gunner are accommodated in their respective cabins on the left and the right hand side of the carriage.

Barrel laying in traverse and elevation was semi-automatic (with an intention of converting it to an automatic line of sight). The weapon benefits from an opto-electronic command and fire control system on battery level, ensuring short response time and quick task accomplishment.

By weighing the options and by compromising between complex (highly automated and heavy) and the simpler solutions, totally acceptable versions concept wise, A. Paligorić successfully completed the development of systems several times more cost effective comparing to other known world weapons in TMG range. The best confirmation and acknowledgment to such an approach was the signing of new export contracts and the delivery of a larger number of 155 mm NORA-B52 artillery systems.

Figure 11. Modernized howitzer 105 mm M101/33

Beside working on the development of NORA-B52 system, Paligorić launched and successfully realized the modernization of 105 mm M56 and 105 mm M101 towed howitzers by installing 33 caliber length barrel (instead of the existing 23 caliber length barrels). That increased their range to 18.0 kilometers with the use of an elongated high explosive projectile and a base bleed (with a slight redesigning and increasing the weapon weight at a firing position), which is by 60% more compared to the basic design with the M1 projectile. Both weapons were selling on a world market (in large quantities).

At the end of 2010, A. Paligorić terminated his cooperation with YI-SDPR ending his intense engagement in the field of designing, developing and manufacturing artillery systems.

After that, following his desire to continue to use his knowledge for doing the work he had dedicated almost his entire life to, he carried on designing, developing, manufacturing, modernizing and overhauling other types of ordnances, armament, and defense equipment in another company.

Highly educated, he spoke French, Russian and English. Having gained professional authority very early on (and rightly so!) he was always there for his associates to discuss and solve any given problem, putting his knowledge, without holding back, at their disposal, selflessly helping them through rough patches in thorny mechanical engineering trade. He demanded continuous improvement from his associates and insisted upon meticulously documenting the results of the engineering work. He left behind thousands of pages of scientific papers, analyses, studies, reports, professional and scientific articles, and he selflessly helped many others by mentoring them and reviewing their work. He spent years (until 1983) as an assistant professor at the Faculty of Mechanical Engineering in Belgrade in the Ballistic Systems Mechanics course, and many generations of military mechanical engineers still remember his educational contribution in forming their first impressions in the field of artillery weapons design.

He was very righteous, principled and firm in interpreting and defending technically justifiable, rational and optimized solutions, but never intolerant and stubborn. Although well aware of his own capabilities, he was modest and ready to let other people take credit for accomplishments that were largely his. Kind and friendly, he charmed everyone with his eloquence and his ability to build and maintain monolith and unified working environment capable of launching and successfully realizing projects and tasks that put our Yugoslav and Serbian artillery praxis on the map.

And he, Anastas Paligorić, became a legend of our artillery in his own lifetime (along with his associates in the field of ballistics and ammunition), a man who had so worthily succeeded and surpassed his teacher, professor Boško Stanisavljević. He received many awards for his work. The last one he received in 2014 was from the Military Technical Institute, from the institute in which his designer's genius came to the full length. He received the ARCHIMEDES Charter as a sign of recognition for outstanding scientific technical contribution in the field of design of artillery weapons.

Imposing achievements, impressive scope of work, personal, scientific and professional integrity, righteousness, consistency, selflessness, widely accepted authority and respect from all he worked with or spent time with - it is a life of a hard working, capable and, above all, modest family man, Anastas Paligorić, inseparably linked with the achievements and accomplishments of the artillery praxis in research and development of armament and defense equipment.

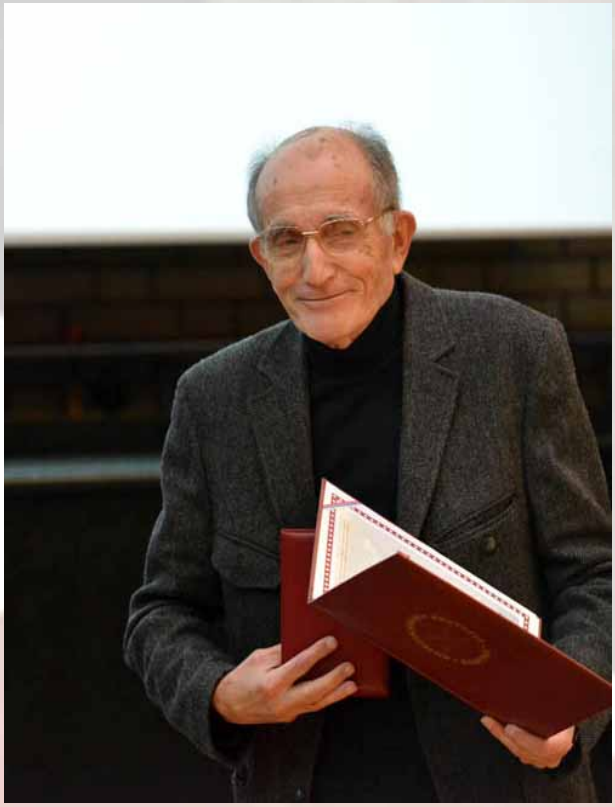


Figure 12. Anastas Paligorić with the ARCHIMEDES Charter

Received: 04.07.2017.
Accepted: 27.07.2017.

ANASTAS PALIGORIĆ – Artiljerijska konstruktorska legenda

Anastas Paligorić je umro sredinom 2017. godine. Bio je jedan od najvećih svetskih projektanata artiljerijskih sistema vatrene podrške. Tokom svoje uspešne inženjerske karijere stvorio je veliki broj minobacača, vučenih i samohodnih artiljerijskih oruđa u kalibrima od 60 mm do 155 mm. Mnogi od tih sistema su i danas atraktivni na svetskom tržištu. NJegov projektantski genije se zasnivao na optimizaciji sistema sa stanovišta usklađivanja veza i interesa između korisnika, projektanta i proizvođača.

Ključne reči: **Anastas Paligorić, artiljerijski sistem, artiljerijsko oruđe, projektovanje nvo, minobacač, top, haubica, samohodna artiljerija, kalibar 60 mm, kalibar 100 mm, kalibar 105 mm, kalibar 120 mm, kalibar 122 mm, kalibar 130 mm, kalibar 152 mm, kalibar 155 mm.**

АНАСТАС ПАЛИГОРИЧ - Легендарный артиллерийский конструктор

Анастас Палигорич умер в середине 2017 года. Он был одним из крупнейших в мире конструкторов и дизайнеров артиллерийских систем огневой поддержки. Во время своей успешной инженерной карьеры он создал большое количество миномётов, прицепных и самоходных артиллерийских оружий калибра от 60 до 155 мм. Многие из этих систем по-прежнему привлекательны на мировом рынке и сегодня. Его дизайнерский гений был основан на оптимизации системы с точки зрения согласования связей и интересов между пользователями, дизайнерами и производителями.

Ключевые слова: **Анастас Палигорич, артиллерийская система, артиллерийское оружие, проектирование НВО, миномёт, пушка, гаубица, самоходная артиллерия, калибр 60 мм, калибр 100 мм, калибр 105 мм, калибр 120 мм, калибр 122 мм, калибр 130 мм, калибр 152 мм, калибр 155 мм.**

ANASTAS PALIGORIĆ – Constructeur légende d’artillerie

Anastas Paligoric est mort en Juin 2017. Il était le plus illustre constructeur de nos jours, chef de projet dans la majorité de projets de développement des pièces d'artillerie appui-feu. Durant sa riche carrière d'ingénieur il a créé un grand nombre de mortiers, de pièces d'artillerie tractées et automoteur en calibres allant de 60 mm à 155 mm. La majorité de ces systèmes sont toujours attrayants sur le marché mondial. Son génie de constructeur se traduit par l'optimisation des systèmes en tenent compte des relations interactives et d'intérêts entre l'utilisateur, le constructeur et le fabricant.

Mots clefs: **Anastas Paligoric, systèmes d'artillerie, construction d'armament, mortier, cannon, obusier, camion équipé d'artillerie, calibre 60 mm, calibre 100 mm, calibre 105 mm, calibre 120 mm, calibre 122 mm, calibre 130 mm, calibre 152 mm, calibre 155 mm.**