REPORT

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MISIJA JUGOIMPORT- SDPR SISTEM INTEGRATORA ODBRAMBENE INDUSTRIJE REPUBLIKE SRBIJE

THE MISSION OF YUGOIMPORT- SDPR - THE SYSTEM INTEGRATOR OF THE SERBIAN DEFENSE INDUSTRY

LAZAR VIŠENAMENSKO OKLOPNO BORBENO VOZILO

LAZAR – MULTI-ROLE ARMORED COMBAT VEHICLE

YUGOIMPORT-SDPR




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MISIJA JUGOIMPORT-SDPR SISTEM INTEGRATORA ODBRAMBENE INDUSTRIJE REPUBLIKE SRBIJE

Piše
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Na pragu 2009. godine, u kojoj naše Javno Preduzeće obeležava 60-godišnjicu poslovanja, Jugoimport-SDPR sve više učvršćuje svoju kompleksnu misiju koncipiranu pre nekoliko godina, koju marketinški opisujemo kroz pojmove «integrišuće snage» i «sistem integratora» srpske odbrambene industrije. Saglasno tome, poslovna strategija Jugoimport-SDPR, utemeljena poslednjih godina, podrazumeva podjednaka pregnuća zaposlenih u dve osnovne misije našeg Javnog preduzeća, jasno uočljive u tekstu naše ISO sertifikacije, koji se nalazi na početnoj strani internog informacionog sistema Jugoimport-SDPR:

THE MISSION OF YUGOIMPORT-SDPR - THE SYSTEM INTEGRATOR OF THE SERBIAN DEFENSE INDUSTRY

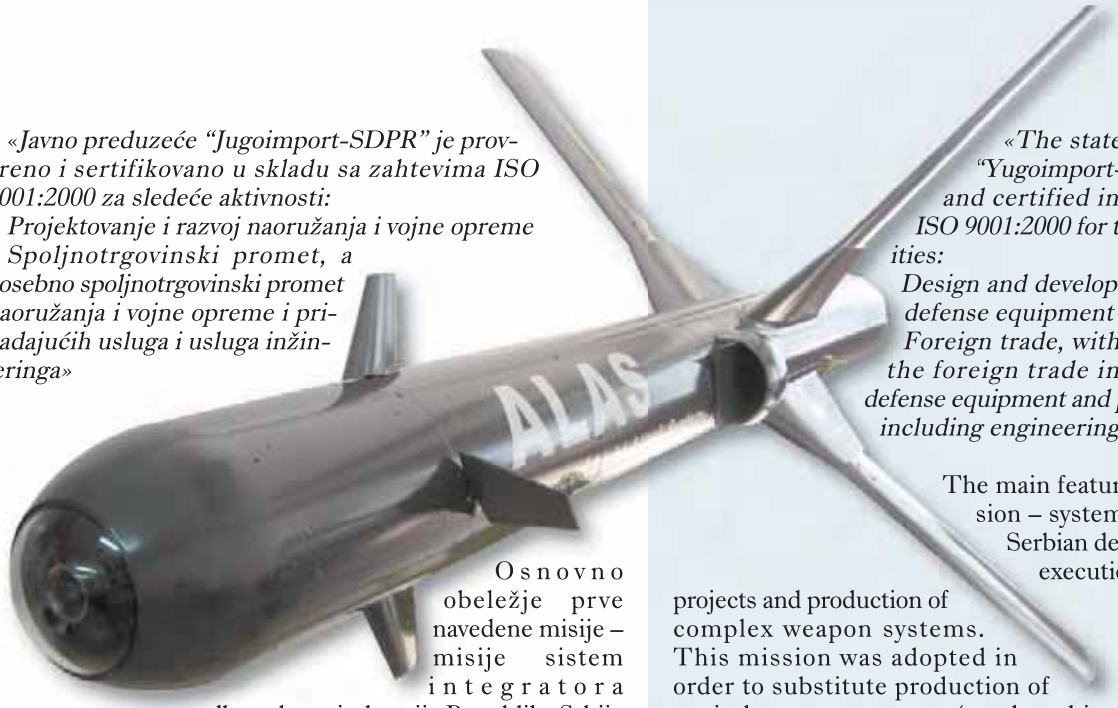
By
dr Nenad Miloradović
Aleksandar Lijaković

On the eve of 2009, in which our company will celebrate its 60th jubilee, Yugoimport-SDPR is re-enforcing its complex mission, outlined a few years back, that can be described in terms of marketing as an «integrating force» and «system integrator» of the Serbian defense industry. In accordance with this, the business strategy of Yugoimport-SDPR, laid out in the past few years, implies that the employees make equal efforts to achieve two main missions, clearly highlighted in the wording of the ISO certification displayed on the first page of the company's internal information system:

«Javno preduzeće "Jugoimport-SDPR" je provereno i sertifikovano u skladu sa zahtevima ISO 9001:2000 za sledeće aktivnosti:

Projektovanje i razvoj naoružanja i vojne opreme

Spoljnotrgovinski promet, a posebno spoljnotrgovinski promet naoružanja i vojne opreme i pripadajućih usluga i usluga inžinjeringa»



Osnovno obeležje prve navedene misije – misije sistem integratora odbrambene industrije Republike Srbije jeste poseban akcenat na izvođenju projekata razvoja i organizacije proizvodnje složenih borbenih sistema. Misija je usvojena sa namerom da se supstituiše proizvodnja kapitalnih borbenih sistema (proizvođenih u bivšim republikama SFRJ) za potrebe sistema odbrane RS i za izvoz, i koncipirana je u skladu sa savremenim trendom i po ugledu na vodeće u svetske proizvođače složenih sistema NVO a koji funkcionišu po principu ''Sistem integratora''. Shodno tome, krajnji cilj ustanovljenja ove nove misije Jugoimport-SDPR jeste opremanje VS kapitalnim borbenim sistemima koncipiranim, razvijenim i proizvedenim u Srbiji, zatim značajno povećanje ukupnog obima izvoza i značajan porast upošljavanja kapaciteta preduzeća odbrambene industrije i drugih domaćih preduzeća, a uz očuvanje, revitalizaciju i proširenje istraživačko-razvojnih kapaciteta MO i civilnih instituta.

«The state-owned company "Yugoimport-SDPR" is verified and certified in accordance with ISO 9001:2000 for the following activities:

Design and development of arms and defense equipment

Foreign trade, with the emphasis on the foreign trade in armaments and defense equipment and pertaining services including engineering services»

The main feature of the first mission – system integrator of the Serbian defense industry – is execution of development projects and production of complex weapon systems. This mission was adopted in order to substitute production of capital weapon systems (produced in the former SFRY Republics) and meet the defense needs of the Republic of Serbia, and was conceived in accordance with the current trends, on the model of the world's leading manufacturers of complex weapon systems acting as system integrators. The final aim of this new mission is to provide capital weapon systems - designed, developed and produced in Serbia - for the Serbian Armed Forces, to increase overall export and employ defense and other local companies, and to keep, revitalize and broaden the research and development capabilities of the MoD and civilian institutes. The mission includes complex activities consisting of various processes, ranging from weapon design solutions made in cooperation with potential MoD users, analysis of main target markets and world trends in development of relevant categories of defense equipment, up to starting up serial production.

Misijom su integrisane kompleksne aktivnosti koje obuhvataju niz procesa, počev od koncipirnja idejnih rešenja borbenih sistema u saradnji sa potencijalnim korisnicima iz MO, analize osnovnih ciljnih tržišta, analize svetskih trendova u razvoju sredstava NVO odgovarajućih kategorija, pa sve do organizacije serijske proizvodnje.

Nova misija Jugoimport-SDPR verifikovana je usvajanjem planova i programa poslovanja u poslednjih 5 godina od strane organa upravljanja preduzeća (u kojima učestvuju predstavnici MO i drugih organa vlade RS), zatim usvajanjem od strane MO RS strategije ulaganja Jugoimport-SDPR u razvoj kapaciteta za proizvodnju složenih NVO, koji su ugovoreni sa stranim i domaćim kupcima i/ili iz usvojenog programa razvoja Javnog preduzeća. Ova misija dobila je svoju potvrdu sertifikatom ISO 9000 : 2001 za projektovanje i razvoj naoružanja i vojne opreme i konačno, nakon obavljene sertifikacije procesa proizvodnje od strane Odeljenja za kontrolu kvaliteta Uprave za odbrambene tehnologije Sektora za materijalne resurse Ministarstva odbrane Republike Srbije, 11.12.2007. godine, dobijeno je rešenje na osnovu kojeg Jugoimport-SDPR J.P. ima dozvolu za proizvodnju naoružanja i vojne opreme (složenih borbenih sistema artiljerijskih, oklopnih, telekomunikacionih kao i municije, KIS, zaštitne opreme).

U toku poslednjih godina, realizacijom navedene misije razvijeno je i uvedeno u serijsku proizvodnju koju Jugoimport-SDPR neposredno realizuje ili organizuje, 10 sistema NVO među kojima:

- Samohodno artiljerijsko oruđe NORA-B/52
- Modernizovana haubica 105 mm,
- Minobacač 60 mm,
- Municija 105 mm povećanog dometa
- Municija 155 ERFB/BB
- Bacač granata jednometni 40 mm BGJ 40,
- Minobacački balistički računar i KIS M07/M07-G
- Prsluk zaštitni balistički i prsluk taktički
- Školski avion Lasta

The new mission of Yugoimport-SDPR was verified through the business plans made in the past five years by the company management (including MoD and other government authorities) and through adopting Yugoimport's strategy of investment into facilities producing complex defense equipment, which had already been contracted for with foreign or domestic customers or adopted by the company's development program. This mission was substantiated by ISO 9000:2001 for design and development of armaments and defense equipment. The certificate being obtained, the Quality Control of the Department of Defense Technologies of the RS MoD Division of Material Resources issued a Decision allowing Yugoimport-SDPR to produce armaments and defense equipment (complex weapon systems, artillery, armored and telecommunications equipment, as well as ammunition, CIS and protective equipment).

Acting on the said mission, in the past few years 10 weapon systems were developed and introduced into serial production, carried out directly by Yugoimport-SDPR. They include:

- Self-propelled artillery weapon NORA-B/52
- Upgraded 105 mm Howitzer
- 60 mm mortar
- 105 mm ammunition, extended range
- 40 mm BGJ 40 grenade launcher, single-shot
- Mortar ballistic computer and CIS M07/M07-G
- Bulletproof and tactical vests
- Lasta training aircraft

Twenty-nine projects are currently in different stages of development, out of which seven are in the final stage of development or in the stage of setting up serial production. Some of them are listed below:

Family of armored fighting vehicles LAZAR, the development of which puts Yugoimport-SDPR as the system integrator of the Serbian defense industry in the front ranks, among the most significant world suppliers of modern AFVs

Anti-tank/multi-purpose long-range missile system with non-line-of-sight guidance (N-LOS) ALAS, representing the most ambitious project in terms of technology

BMS M84AB1 command and information system for armored units, which makes the basis for development of a complex CIS for the Army

Upgraded M84AB1 tank, developed in cooperation with indigenous and foreign technolgical partners

Universal optoelectronic multisensor station (TOMS)

MI-8/17 helicopter and Lasta aircraft 12.7 mm machine-gun pod

Resources for implementation of the development and production strategy of Yugoimport-SDPR include internal company resources and the resources of its technological partners.

U različitim fazama razvoja trenutno se nalazi 29 projekata, od kojih je 7 u završenoj fazi razvoja ili u fazi osvajanja serijske proizvodnje. Ovde navodimo neke razvojne projekte:

Familija oklopnih borbenih vozila LAZAR, čijim razvojem Jugoimport-SDPR kao sistem integrator srpske odbrambene industrije istupa u red značajnijih svetskih ponuđača u oblasti savremenih oklopnih borbenih vozila

Protivoklopni/višenamenski raketni sistem velikog dometa sa principom vođenja bez neposrednog vizuelnog operatora sa ciljem ALAS, koji predstavlja u tehničko-tehnološkom smislu najambiciozniji razvojni projekat

BMS M84AB1 Komandno-informacioni sistem (KIS) za OMJ, koji predstavlja osnovu razvoja kompleksnog KIS za KOV

Modernizovani tenk M84AB1 razvijen u saradnji sa domaćim i stranim tehnološkim partnerom

Univerzalna optoelektronska multisenzorska stanica (TOMS)

Podvesni kontejner sa mitraljezom 12,7mm za helikopter MI-8/17 i avion Lasta

Resursi za realizaciju razvojno-proizvodne strategije Jugoimport-SDPR obuhvataju interne resurse Jugoimport-SDPR J.P i eksterne resurse tehnoloških partnera.

Interne resurse Jugoimport-SDPR čine Sektor za razvoj, inženjering i tehničku podršku, sa svojim visokostručnim kadrom, koji poseduje značajno iskustvo i reference u vođenju projekata iz oblasti razvoja i proizvodnje složenih borbenih sistema, Sektor za proizvodnju sa visokostručnim kadrom sa značajnim iskustvom i referencama u rukovođenju velikim preduzećima i poslovnim sistemima, sopstveni razvojno-proizvodni pogoni i finansijski i menadžerski potencijal za realizaciju projekata razvoja i proizvodnje.

Eksterni resursi naših tehnoloških partnera obuhvataju razvojne institucije iz RS – VTI, civilne institute, fakultete, zatim preduzeća odbrambene industrije i druge proizvodne organizacije iz RS i strane tehnološke partnere angažovane u projektima zajedničke proizvodnje i razvoja, ili kao isporučioci visokosofisticiranih podsistema i komponenti.

Odakle je proistekla tako izrazita potreba za uspostavljanjem misije «sistem integratora» ?

Period od poslednjih petnaestak godina svuda u svetu karakterišu značajne promene u pristupu razvoju i proizvodnji NVO i promene organizacione strukture i funkcionalne prinadležnosti i povezanosti institucija i preduzeća učesnika u tim procesima. Pre svega, svi učesnici u trijadi - korisnik, industrija i komercijalno preduzeće - imaju značajno ravnomerniji odnos u smislu ingerencija za realizaciju. Industrijska preduzeća koja su nosioci razvoja i proizvodnje, iz prevashodno državnog oblika vlasništva i upravljanja karakterističnog za prethodni period kroz vlasničku transformaciju menjaju strukturu kapitala, te postaju deoničarska društva. Za razliku od prethodnog perioda, kada je to bio redak slučaj (sporadično realizovan u Zapadnoj Evropi) industrijski deo razvojnih timova sada je

Yugoimport-SDPR's internal resources include the Division for Development, Engineering and Technical Support, with its expert personnel experienced in managing projects in the field of development and production of complex combat systems, Production Division with its expert personnel experienced in managing large companies and business systems, and development and production facilities, as well as financial and managerial resources for implementation of development and production projects.

External resources of our technological partners include research institutions in the Republic of Serbia (RS): The Military Technical Institute, civilian institutes, defense companies and other production organizations from RS and technological partners from abroad engaged in co-production and development projects or engaged as suppliers of highly sophisticated subsystems and components.

How was the need for the «system integrator» mission born?

The last fifteen years have been characterized throughout the world by significant changes in defense equipment development and production, and by the change in the structure, functional competence and correlation of the institutions and companies taking part in the development process. Now, all the participants in the triad consisting of the user, manufacturer and commercial entity are more equal in terms of their responsibilities for project imple-

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nadnacionalan, odnosno multinacionalan. Navedeni period karakteriše i stvaranje multinacionalnih korisničkih timova, koji nastaju radi smanjivanja rizika razvoja i rasterećenja budžeta, pre svega racionalizacijom iskorišćenja proizvodnih kapaciteta udruženih kompanija učesnika u projektima, a utiče dalje i na racionalizaciju i unifikaciju sredstava NVO u upotrebi u OS partnerskih zemalja. Slični procesi uočljivi su poslednjih godina i u Rusiji, gde je transformacijom državnog vlasništva i tradicionalnog državnog upravljanja razvojem i proizvodnjom došlo do formiranja industrijskih koncerna koji se bave proizvodnjom borbenih sistema KoV i PVO, dok je u toku formiranje kompleksa na nivou borbenih sistema RV.

Neprekidni razvoj kompleksnih sistema NVO dovodi do značajnog usložnjavanja tehnologija i samim tim broja i prirode učesnika u projektima, te se pojavljuje potreba za formiranjem „sistem integratora"- preduzeća koje objedinjuje više preduzeća integratora podsistema, koji integriše i komercijalne učesnike.

U sredini kao što je naša, formiranje takvih timova predstavlja manji organizacioni problem nego što je to u znatno složenijim sredinama kakve predstavljaju zapadnoevropske zemlje.

Posmatranjem navedenih procesa u zemljama Zapada uočava se trend da zbog kompleksnosti projekta, institucije MO smatraju neracionalnim da samostalno rukovode procesima razvoja kapitalnih borbenih sistema, pre svega što takva organizacija razvoja neminovno uzrokuje brojčano povećavanje kadra u odgovarajućim institucijama MO, tako da se saglasno opšteprisutnim tendencijama za redukciju ljudskih resursa, upravljanje projektima razvoja poverava sistem integratorima.

Složenost proizvoda-kapitalnog sistema NVO, a samim tim procesa upravljanja i koordinacije takvih projekata, dovodi takođe do brisanja podele preduzeća po oblastima za koje su tradicionalno vezana u tehnološkom smislu: tako na primer, kompanija BOEING, čija osnovna delatnost obuhvata pre svega vojnu i civilnu vazduhoplovnu tehniku, predstavlja sistem integrator za razvoj kapitalnog projekta KoV SAD „Future Combat System" (FCS – kompleksni borbeni sistemi KoV, koji obuhvata razvoj više familija borbenih vozila, artiljerijskih sistema vatrene podrške, sistema opreme pešadije, familija bespilotnih letelica i dr)

Saglasno iskustvu, projekti razvoja složenih, tj. kapitalnih borbenih sistema zahtevaju značajne razvojne aktivnosti i sredstva da bi se uspešno okončali; pristup projektima „smart acquisition" smatramo vrlo interesantnim, budući da podrazumeva mogućnost redizajniranja u poodmakloj fazi razvoja, u smislu privremenog zaustavljanja razvoja na dostignutom i tehnološki i taktički prihvatljivom nivou, na kojem sredstvo ulazi u proizvodnju, dok se dalje nastavlja sa razvojem do postizanja punih performansi.

mentation; manufacturers, as the champions of development and production, that were previously state-owned companies are now being transformed into shareholding companies. Compared to the previous periods, when this was rare (or sporadic in the countries of Western Europe) the industrial part of the development teams is now transnational, or multinational. In addition, today we are also witnessing formation of multinational user teams, in order to lower development risks and relieve the budget, mainly by a more rational use of production resources of the companies involved in the joint project, which then has further impact on rationing and unification of defense equipment of the partner countries' armed forces. Similar processes have been taking place in Russia as well, where transformation of the state ownership and traditional state management, led to formation of industrial concerns dealing with army and air defense weapon systems, while establishment of a corporation for air force systems is still in progress.

Ono što nam otvara perspektivu jeste raspoloživost komponenti i podsistema koji su po izdržljivosti i performansama primenljivi u složenim, tj. kapitalnim sredstvima NVO, čime se smanjuje rizik razvoja, skraćuje vreme i smanjuju troškovi.

Jugoimport-SDPR ustanovio je koncept agresivnog marketinga, koji podrazumeva, između ostalog, tržišnu promociju borbenog sistema u ranim fazama razvoja, na osnovu koje se donose zaključci o perspektivnosti daljeg razvoja i izvode eventualne korekcije koncepta i tehničkih rešenja.

Druga misija, koja je u praksi ustanovljena od početka 50-ih godina, kada počinju prvi izvozni poslovi odbrambene industrije Jugoslavije, a koja podrazumeva funkciju osnovnog marketinško-komercijalnog eksponenta odbrambene industrije i uvoznika za potrebe Vojske Srbije, zadržava svoje značajno mesto u našem poslovanju.

Jasno je da je srpska odbrambena industrija bila i da ostaje osnovni strateški partner Jugoimport-SDPR. Jugoimport-SDPR marketinški i komercijalno podržava njene razvojne i proizvodne programe, kao njena «integrišuća snaga».

Ove godine, osim uspešne realizacije ugovora potpisanog sa iračkim MO prošle godine, ostvarujemo značajne komercijalne uspehe na tržištu zemalja Bliskog Istoka, Afrike i Azije.

Marketinško prisustvo na svetskom tržištu NVO realizujemo učešćem na tri do četiri značajne međunarodne izložbe NVO godišnje, saglasno opredeljenju koje je ustanovljeno pre nekoliko godina, a uz postepeno povećanje ulaganja u sadržaj i formu nastupa. Sredstva koja prikazujemo na izložbama, posebno kapitalni borbeni sistemi iz realizovanih i aktuelnih razvojnih projekata, kao i vesti o našim komercijalnim uspesima, sve više ukazuju svetskom tržištu proizvoda i usluga u oblasti odbrane na rastući značaj srpske odbrambene industrije, kao i Jugoimport-SDPR kao njene integrišuće snage i sistem integratora. Tokom 2008. godine učestvovali smo na izložbama DEFEXPO 08 u Nju Delhiju, Indija, SOFEX 2008 u Amanu, Jordan, DSA 2008 u Kuala Lumpuru, Malezija i EUROSATORY 2008, u Parizu, Francuska. Posebno možemo istaći izložbu EUROSATORY, na kojoj je Jugoimport-SDPR učestvovao i u organizaciji nastupa Ministarstva odbrane Republike Srbije, sa kojim je naše Javno preduzeće nastupilo na sajamskom prostoru «ostrvskog» tipa, u vidu srpskog nacionalnog paviljona.

Saglasno od početka podržanoj inicijativi Beogradskog sajma i Ministarstva Odbrane, Jugoimport- SDPR

Continuous development of complex weapon systems is accompanied with new, more complex technologies, that in turn increases the number and nature of project participants. This is why there is a need for a «system integrator», a company that brings together several subsystem integrators and commercial entities.

Formation of such teams in our milieu creates only minor organizational problems compared to some more complex countries of the Western Europe.

The trends of the said processes in the Western European countries indicate that, due to the complexity of projects, MoD institutions consider management of capital weapon systems development uneconomical, because it would inevitably result in the increase of MoD staff, and since global trends are to reduce human resources, project managment is transferred to system integrators.

Complex products – capital weapon systems, project management and coordination have erased the traditional division of technological domains of different companies: for example, BOEING which is mainly involved in military and civilian aircraft technology, is the system integrator for development of a capital US Army project called „Future Combat System" (FCS – complex army weapon systems, including several families of fighting vehicles, artillery systems, infantry systems, families of UAVs etc.)

Experience tells us that development projects of complex weapon systems call entail considerable development activities and funds in order to be finalized; „Smart acquisition" approach seems very interesting, because it offers the possibility of redesign when the development process is in advanced stage, meaning that development can be stopped at an acceptable technological and tactical level to enter production, while it is still being developed until all the performances have been achieved.

What offers bright prospects is the availability of components and subsystems with good features and performance, so that they can be readily built in complex weapon systems. This lowers development risks, reduces the cost and is less time consuming.

Yugoimport-SDPR has adopted the concept of aggresive marketing approach, including among other things, promotion of a weapon system in the early stages of development. This helps to make good conclusions as to the prospects of further development and, if necessary, as to the design and other technical corrections.

The second mission was put into practice in the early fifties, when the first export deals for the Yugoslav defense companies were made. This mission makes our company the main marketing and commercial exponent of defense industry and importer for the Serbian Armed Forces, and it still has its rightful place in our business dealings.

Obviously, the Serbian defense companies have been and will remain the key strategic partners of YI-SDPR. Yugoimport-SDPR offers marketing and commercial support to their development and production programs, acting as an integrating force of the Serbian defense industry.

priprema nastup na izložbi PARTNER 2009 u svojstvu integratora promocije odbrambene industrije Republike Srbije, a analogno nastupima na izložbama PARTNER 2004, 2005. i 2007. Ova izložba biće istovremeno prilika za širu promociju pred javnošću Republike Srbije napred navedenih razvojnih projekata, kao i razvojnih i proizvodnih programa preduzeća srpske odbrambene industrije. Kao i do sada, preduzeća Zastava Oružje, Kragujevac, Krušik, Valjevo, Sloboda, Čačak, Milan Blagojević Lučani, Prva iskra Barič, Prvi Partizan Užice, Prva Petoleteka Trstenik, Utva Pančevo, 14. oktobar Kruševac i druga, nastupiće na zajedničkom štandu na kome Jugoimport-SDPR integriše nastup srpske odbrambene industrije.

Saglasno svetskim trendovima u organizaciji međunarodnih izložbi NVO razmatramo mogućnost da se u program uvedu funkcionalne demonstracije sredstava NVO, koje obuhvataju demonstracije pokretljivosti i vatrene moći sredstva KOV, a koje se organizuju na fizički odvojenim poligonima. Takođe, budući da se u okviru međunarodnih izložbi NVO takođe uobičajeno održavanje međunarodnih konferencija sa naučnim radovima iz oblasti istraživanja, razvoja, proizvodnje, globalne proliferacije i upotrebe sredstva NVO, koji uključuju radove sa predikcijom osnovnih trendova razvoja NVO i osvrtom na sliku globalne i regionalne bezbednosti, razmatramo i mogućnost obogaćivanja izložbe sličnim sadržajem.

Osim nastupa na međunarodnim izložbama NVO, Jugoimport-SDPR posebnu pažnju posvećuje organizaciji multimedijalnih prezentacija, funkcionalnih demonstracija i dinamičkih ispitivanja sredstava NVO za predstavnike potencijalnih korisnika u zemlji i inostranstvu.

Vezano za misiju uvoza sredstava NVO, ističemo da je Uredbom Vlade Republike Srbije od septembra 2008. Javnom Preduzeću Jugoimport-SDPR-u vraćen status ekskluzivnog uvoznika složenih oružnih sistema i pripadajućih usluga za potrebe Ministarstva odbrane Republike Srbije.

This year, except for the successful implementation of the contract signed with the Iraqi MoD last year, we have continued to score points in the Near East, African and Asian markets.

We make ourselves present on the global defense market by taking part in several international defense exhibitions every year, in line with the strategy adopted a few years back, but gradually investing more funds in the nature and form of our participation. The weapons displayed at these exhibitions, especially the capital weapon systems from the finalized development projects and the ones still in progress, as well as the spreading news of our commercial success, point out to an ever increasing importance of the Serbian defense industry and YI-SDPR as its system integrator on the global defense market. In 2008, we took part in the following exhibitions: DEFEXPO 08 in New Delhi, India, SOFEX 2008 in Aman, Jordan, DSA 2008 in Kuala Lumpur, Malesia and EUROSATORY 2008 in Paris, France. We would like to place a special emphasis on our participation at the EUROSATORY exhibition, where Yugoimport-SDPR was introduced with the Serbian MoD as well, at the national «island-type» pavillion.

Responding to the initiative of the Belgrade Fair and the Ministry of Defense started a few years ago, Yugoimport-SDPR is preparing for the PARTNER 2009 exhibition as the integrator and promoter of the RS defense industry, in line with its previous displays at the same show in 2004, 2005 and 2007. This exhibition will be a good opportunity to promote the above mentioned development projects of the Serbian defense companies to the general public in the Republic of Serbia. Like before, Zastava Arms from Kragujevac, Krusik from Valjevo, Sloboda from Cacak, Milan Blagojevic from Lucani, Prva iskra from Baric, Prvi partizan from Uzice, Prva petoletka from Trstenik, Utva from Pancevo, 14 Oktobar from Krusevac and other companies will present themselves at a joint stand, where Yugoimport-SDPR will appear as the integrator of the Serbian defense industry.

Keeping up with the global trends in defense exhibition organization, we are considering to bring in demonstrations in the program, including mobility and firepower, that would be carried out on separate grounds. In addition, since international defense exhibitions usually include various conferences with research papers on development, production and global proliferation of defense equipment, and papers predicting the main trends of defense equipment development, as well as reviews on global and regional security issues, we are considering the possibility to enrich the exhibition with similar contents.

Apart from participation in international defense exhibitions, Yugoimport-SDPR pays special attention to its multimedia presentations, demonstrations and dynamic testing of defense equipment before potential users in the country and abroad.

Regarding the mission of defense equipment import, we have to point out that by the Decree of the Government of the Republic of Serbia of September 2008, Yugoimport-SDPR was given back the status of the exclusive importer of complex weapon systems and services for the needs of the Ministry of Defense of the Republic of Serbia

VIŠENAMENSKO OKLOPNO BORBENO VOZILO "LAZAR"

Piše
Aleksandar Lijaković
Miloljub Trifunović

Aktuelni svetski trendovi u razvoju oklopnih vozila točkaša – koncepti MRAV i MRAP

Na savremenom globalnom tržištu NVO tokom tekuće dekade vrlo su uočljivi trendovi masovnog opremanja OS velikog broja zemalja oklopnim vozilima točkašima dve osnovne kategorije, poznate po engleskim skraćenicama MRAV (Multi Role Armored vehicle) i MRAP (Mine Resistant Ambush Protected Vehicle). Radi se o dve kategorije vozila, koje se bitno razlikuju po nekim osnovnim konceptualnim paramerima, kao i osnovnoj taktičkoj nameni, ali koja takođe mogu biti uporediva po svojim osnovnim performansama i paramerima efikasnosti u upotrebi u nekim danas najznačajnijim kategorijama oružanih sukoba, kao što su pre svega protivteroristička /protivgerilska dejstva, tj. operacije kontrole teritorije u zonama terorističkih/pobunjeničkih aktivnosti, mirovne operacije i sl.

LAZAR – MULTI-ROLE ARMORED COMBAT VEHICLE

By
Aleksandar Lijaković
Miloljub Trifunović

Current world trends in the development of wheeled armored vehicles - MRAV and MRAP concepts

In the course of current decade, global arms and defense equipment markets show noticeable trends of massive introduction into service with numerous armed forces of wheeled armored vehicles belonging to two main categories, known by their English language acronyms MRAV (Multi Role Armored Vehicle) and MRAP (Mine Resistant Ambush Protected Vehicle). These refer to two classes of vehicles that differ in some of their essential conceptual parameters and their main tactical applications, but which offer comparable main performance levels and parameters of combat effectiveness in certain kinds of present-day armed conflicts, such as anti-terrorist / counter-guerilla operations, control of territories in areas threatened by terrorist/rebel activities, in peacekeeping missions, etc.

MRAV (Višenamesko oklopno vozilo)

Nabavka nove generacije familija višenamenskih oklopnih vozila (Multi Role Armored vehicle - MRAV) postao je imperativ opremanja oružanih snaga vodećih zemalja Zapada, tokom tekuće dekade. Ubrzo za time, prateći ovaj trend, i druge zemlje, pre svega članice NATO, ali i OS zemalja iz drugih delova sveta, počele su da razmatraju i realizuju nabavke familija ovih vozila. Kako se u najkraćem može definisati opšti koncept ove kategorije vozila: To su, pre svega, oklopna vozila točkaši formule pogona 8x8, sa samonosećom konstrukcijom oklopnog tela i nezavisnim sistemom oslanjanja (ređe sa šasijom, kao npr finska PATRIJA i nemački BOXER). Konstrukcijom ovih vozila obezeđena su amfibijska svojstva. Oklopno telo izrađeno od pancirnog čelika kojim je obezbeđen relativno visok nivo balističke zaštite, uz mogućnost ugradnje dodatnog montažno-demontažnog oklopa, izađenog pre svega na bazi kompozitnih materijala (kombinacijom keramike, polietilena visoke molekularne gustine/aramidni materijali) ili u vidu principijelno drugačijih sistema dodatne zaštite, na bazi. šipkastih (kavezastih) oklopa, ili eksplozivno reaktivnog oklopa namenjenih smanjivanju efikasnosti ručnih protivopklopnih sredstava. Ova vozila su po svojoj koncepciji višenamenska, što znači da se ona mogu koristiti kao: oklopni transporteri, borbena vozila pešadije, izviđačka vozila,... U osnovnoj varijanti ova vozila se koriste kao oklopni transporteri kojima se prevozi pešadijsko odeljenje od 8 do12 ljudi, koje se ukrcava u vozilo kroz zadnja vrata. Rešenje koncepta vozila omogućava da se pripadnici ukrcnog odelenja pešadije prevoze u sedećem položaju, u zasebnim sedištima, okrenuti najčešće prema unutrašnjosti vozila, tj. bez mogućnosti da se iz vozila dejstvuje ličnim naoružanjem. Stalnu posadu vozila čine, osim vozača i komandira i operator naoružanja, koje je najčešće rešeno u vidu daljinski upravljane oružne stanice, snadbevene senzorskim sistemima i naoružanjem, koje se sastoji, u zavisnosti od rešenja, alternativno, od najjednostavnije tj. najskromnije varijante - mitraljeza kalibra 7.62 mm, zatim mitraljeza 12.7 mm, automatskog bacača granata 40 mm, kao i automatskih topova 20 mm, 25 mm, 30 mm, u kombinciji sa mitraljezima i protivoklopim vođnim raketama. Konceptom vozila obezeđen je određen nivo protivminske zaštite u slućaju kontakta sa protivtenkovskim minama i drugim improvizanim ekspozivnim napravama. Vozila karakterišu relativno velike gabaritne dimenzije i srazmerno velika masa, složeni sistemi za pogn i prenos snage, što sve zajedno uzrokuje vrlo visoke cene vozila. Svako od vozila te kategorije predstavlja osnovu za razvoj familije oklopnih vozila, koja, osim prethodno navedenih varijanti, obuhvata i samohodni minobacač/artiljerijsko oruđe, samohodni artiljerijsko-raketni sistem PVO, komandno vozilo, ambulantno vozilo, vozilo za izvlačenje itd.

MRAP (Vozilo otporno na mine i zaštićeno od zasednih dejstava)

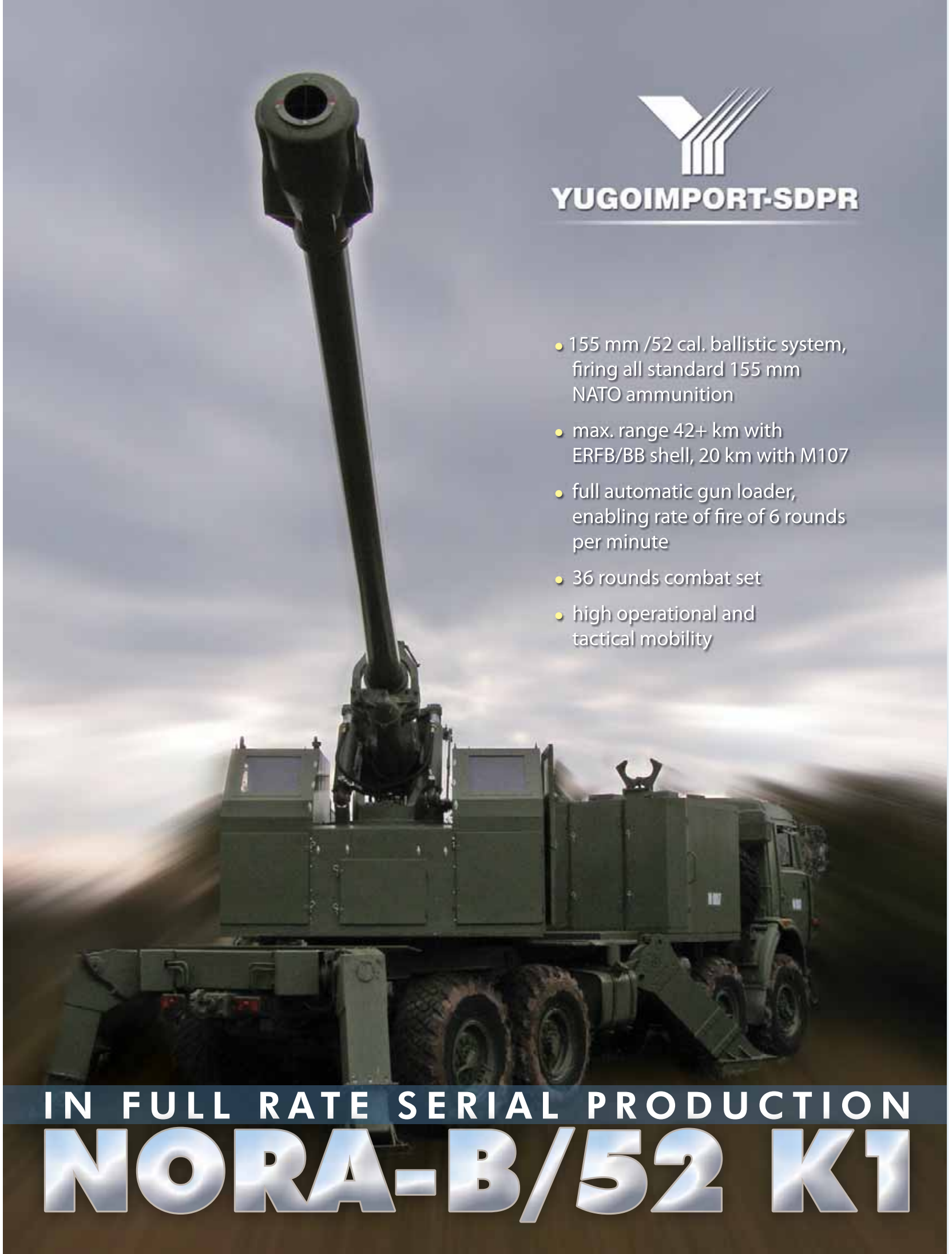
Savremeni uslovi rata protiv terorizma, tj iskustva vodećih zemalja zapada predvođenih SAD u Avganistanu i Iraku, diktirali su ubrzani razvoj koncepta sasvim nove kategorije vozila, nazvane vozila zaštićena od dejstva mina i zasednih dejstava (Mine Resistant Ambush Protected Vehicle- MRAP). Razvoj koncepta ovih vozila bio je iniciran potrebom da se

MRAV (Multi Role Armored Vehicle)

Procurement of new-generation families of multi role armored vehicles (MRAV) has become an imperative for armed forces of leading Western countries in the current decade. This trend is being followed by other, primarily NATO member countries, but also by armed forces in other parts of the world that are considering or undertaking procurement of these vehicles. This type generally comprises wheeled 8 x 8 vehicles based on self-carrying armored hull structure, using independent suspension (rarely with chassis, as like Finnish PATRIA or German BOXER), featuring high off-road mobility as well as amphibious capability. Armor hull structure is consisting of welded armor plates providing all-arc ballistic protection, as well as ability to replace/retrofit modules of superstructure composite armor, primarily made of ceramics/fiber composite modular removable segments with possibility for fitting of other principally different additional protection, such as rod-type (cage-type) armor or explosive reactive armor (ERA) designed to alleviate damage from hand-held anti-armor projectiles. Vehicles have in basis multi-role features, meaning that various versions can be used as like infantry fighting vehicles (IFVs), armored personal carriers (APCs), reconnaissance vehicles etc. Basic version of the type serves to transport infantry section of 8-12 soldiers that can be rapidly evacuated through tailgate. Vehicle concept provides transport of on board complement in individual seats, most often facing vehicle interior i.e. without the ability to fire personal weapons. Vehicle permanent crew consists of driver, commander and weapons operator; weapons in their simplest configuration consisting of cal 7.62mm machine gun, or complemented with 12.7mm machine gun, cal. 40mm automatic grenade launcher, automatic guns cal. 20mm, 25mm or 30mm, in combination with machine guns and antitank guided missiles. The concept provides some level of antitank mine and improvised explosive device (IOD) protection. Such vehicles are characterized by relatively large dimensions, complex engine, transmission and suspension systems – all of which resulting in their high price. Every model in this category represents a basis for development of a family of armored vehicles that include, beside APC version, self-propelled mortar/artillery platform, self-propelled AA gun/ air defense missile platform, command vehicle, medical evacuation, recovery vehicle, etc.

MRAP (Mine Resistant Ambush Protected) Vehicle

Contemporary anti-terrorist military conflicts waged by Western countries, led by the USA, in Afghanistan and Iraq, have led to accelerated development of novel kind of armored vehicles – Mine Resistant Ambush Protected Vehicles (MRAP). That development was dictated by the need to engage motorized infantry in everyday patrol duties in areas of expected insurgent/terrorist actions, in cities and villages and in hilly or mountainous intersected countryside where ambushes are reasonably expected or where they daily occur, waged by opponents employing small arms fire, anti-armor hand launchers, mortars, antitank mines and improvised explosive devices activated remotely or by trip wire, etc. In the period that preceded escalation of surprise ambush


YUGOIMPORT-SDPR
• 155 mm /52 cal. ballistic system, firing all standard 155 mm NATO ammunition
• max. range 42+ km with ERFB/BB shell, 20 km with M107
• full automatic gun loader, enabling rate of fire of 6 rounds per minute
• 36 rounds combat set
• high operational and tactical mobility
IN FULL RATE SERIAL PRODUCTION
NORA-B/52 K1

ukrcana pešadija angažovana na zadacima svakodnevnih dužnosti patroliranja u zonama očekivanih dejstva pobunjenika/terorista, kao i potrebom transporta do tih zona, prevozi u uslovima konstantne pretnje od mina i zasednih dejstava terorista/gerilaca/pobunjnenika. Ovo posebno u ambijentu različitih tipova naseljenih mesta gradskog ili seoskog područja i brdsko-planinskom i ispresecanom zemljištu, gde se očekuju, tj. svakodnevno dešavaju, iznenadna zasedna dejstva streljačkom vatrom, ručnim protivoklopnim sredstvima, minobacačlima, protivtenkovskim minama ili improvoizovanim ekslozivnim napravama sa daljisnkim ili nagazno-poteznim aktiviranjem i sl. U periodu koji je prethodio eskalaciji navedenih zasednih dejstava karakterističnih za uslove aktuelnih oružanih sukoba koji se vode u Avganistanu i Iraku, jedinice angažovane na patroliranju i izviđanju, obezbeđenju zona, kontroli teritorije, protivterorističkim dejstvima i sl, prevozile su se u standardnim terenskim vozilima bez balističke zaštite, ili sa balističkom zaštitom od dejstva streljačkog naoružanja sa običnom municijom. Aktuelna iskustva masovne taktičke primene zasednih dejstava, i to posebno u naseljenim urbanim i seoskim područjima, tako i na ispresecanom zemljištu, a koja uključuju upotrebu raznih kategorija improvizovanih eksplozivnih naprava, protivtenkovskih mina, streljačku vatru i dejstvo ručnih protivokloipnih sredstva, pokazala su da standardna vozila tih tipova karakteriše poražavajuće nizak nivo otpornosti na takva dejstva, što je dovelo do vrlo visokih gubitaka u ljudstvu koje se prevozi. Odgovor na tu pretnju bio je razvoj nove kategorije vozila, skraćeno nazvanih MRAP, pre svega na bazi konverzije postojećih transportnih terenskih kamiona.

actions so characteristic for present-day armed conflicts in Afghanistan and Iraq, military units engaged in patrolling, reconnaissance, area control and securing duties and in anti-terrorist operations, were transported in standard patrol and transport vehicles which had little or no armor protection or were protected against small arms FMJ ammunition only. Current experience gained from massive use of ambush engagements, especially in urban and rural areas and in intersected countryside, waged by using wide range of improvised explosive devices, antitank mines, small arms fire and antitank rocket launchers, testifies that standard vehicles have appallingly low resistance against such actions, which have led to very high losses of transported manpower. Response to that threat was development of new category of vehicles, designated MRAP, that were primarily based on converting existing off-road utility vehicles.

Manpower transported in such environment must be able to maintain continuous observation of its surroundings and, in case of need, to quickly disembark the vehicle and assume battle order on the ground. Concept of realization of that category vehicle involves converting of various types of current off-road patrol and utility vehicles – trucks based on cross-country chassis with solid drive axles that are highly resistant to mines, in 4x4, 6x6 or 8x8 configurations. In addition, relatively high clearance of base armor plates from the ground, characteristic for this concept of vehicles, considerably reduces effects of shock wave caused by stepping on antitank land mines against the vehicle, which is a tangible advantage over the concept of current MRAV vehicles.

Ukrcano ljudstvo u takvim uslovima mora biti sposobno da izvodi neprekidno osmatranje okoline i po potrebi direktno dejstvuje iz vozila streljačkim naoružanjem, te se brzo i efikasno iskrca iz vozila i razvije u borbeni poredak na terenu. Koncept realizacije vozila ove kategorije je u osnovi baziran na konverziji različitih kategorija terenskih patrolnih vozila i teretnih transportnih vozila - kamiona razvijenih na bazi kamionskih šasija visoke prohodnosti, sa krutim pogonskim mostovima, koji je omogućio postizanje visokog nivoa protivminske zaštite, formula 4x4, 6x6 i 8x8. Osim toga, realativno velika udaljenost donjih oklopnih ploča od površine zemlje, karakteristična za ovakav koncept vozila, omogućava značajno opadanje efikasnosti udarnog talasa nastalog eksplozijom nagaznih protivtenkovskih mina i drugih eksplozivnih naprava na telo vozlila, što predstvalja značajnu prednost i nad konceptom savremenih vozila tipa MRAV.

Osnovni zahvati konverzije sastoje se u modularnoj ugradnji oklopnih tela sa: osmatračkim prozorima i puškarnicama za ukrcno odeljenje izrađenim od pancirnih stakala odgovarajuće balističke zaštite, protivminskom zaštitom, kao i naoružanjem, koje se najčešće ugrađuje u oklopljene turele sa manuelnim upravljanjem, naružanih mitraljezima kalibra 7.62 m i 12. 7 mm. Takođe, vozila su po pravilu opremljena i uređajima za ometanje daljinski upravljanih eksplozivnih naprava na bazi mreže mobilne telefonije ili drugih radiosignala različitih frekvencija, kojima se onemogućava aktiviranje ovih sredstava u okolini vozila, na rastojanjima do nekoliko desetina metara, kao i bacačima dimnih kutija.

Main conversion interventions comprise fitting of armored plates or complete modular armored hulls, including portholes made of armored glass for on-board personnel, antimine protection and fitting of armament that usually consists of armor-protected, manually operated machine gun cupolas, employing cal. 7.62mm and 12.7mm machine guns. In addition, these vehicles are as a rule outfitted with jamming equipment designed to jam remotely controlled explosive devices operating in mobile phone and other radio frequencies in the vicinity, at ranges of several dozen meters, and with smoke pot dischargers.

Program of equipping the US armed forces with MRAP class vehicles is the third largest in value among all defense equipment projects, after the Joint Strike Fighter and ballistic missile defense programs.

Experience of Serbian (and ex-Yugoslav) defence industry

Armed forces of Serbia, namely Serbian Army as well as Serbian Police, have encountered the threat of terrorist/insurgent activities considerably earlier than threat posed to Western states in Iraq and Afghanistan. Response to the threat to us initially consisted of low-budget, practically improvised projects of armoring and arming cross-country and utility vehicles in service with the police and army forces. Armoring included fitting of steel armor plates and armored glass; arming consisted of mounting machine guns cal. 7.62mm and 12.7mm, automatic grenade launchers cal. 30mm and recoilless guns cal. 82mm on hydraulically extended platforms, as well as mounting of lightly armored or soft cupolas.

Opremanje OS SAD vozilima kategorija MRAP predstavlja treći po obimu angažovanih finansijskih sredstava program opremanja, odmah iza programa višemenskog borbenog aviona (JSF) i sistema odbrane od balističkih raketa.

Iskustva i reference srpske (jugoslovenske) odbrambene industrije

OS Republike Srbije, i to kako VJ, tj. VS, tako i snage MUP-a, suočile su se sa pretnjama terorističkih/pobunjeničkih dejstava protivnika značajno pre OS zapadnih zemalja u Iraku i Avganistanu. Odgovor na takve pretnje u početku se sastojao od niskobudžetnih, kao i praktično improvizovanih projekata oklopljavanja i naoružavanja terenskih i teretnih vozila raspoloživim u jedinicama MUP-a i Vojske. Oklopljavanje je vršeno pločama pancirnog čelika i uz upotrebu pancirnih stakala, a naoružavanje ugradnjom mitraljeza kalibra 7.62 mm i 12.7 mm, bacača granata automatskih kalibra 30 mm, i bestrzajnih topova kalibra 82 mm na hidraulički podižuće platforme, kao i razne lakopoklopljene i neoklopljene turele. Zahvati oklopljavanja i naoružavanja vršeni su na terenskim vozilima LANROVER DEFENDER, HUMMER, UAZ, PINCGAUER, kao i na teretnim vozilima TAM-110, TAM-150 koji su bili raspoloživi u jednicama MUP-a Republike Srbije i tadašnje Vojske Jugoslavije.

U upotrebi u VS se već preko dvadeset godina nalazi oklopno borbeno vozilo familije BOV specijalizovano za upotrebu u jednicama vojne policije pri rešavanju taktičkih situacija raznih vidova protivpobunjeničkih i protivterorističkih dejstava, oznake BOV-3 ili VPB M-86, koje se i danas nalazi u upotrebi u VS. To vozilo je razvijeno korišćenjem eleme-

These protective interventions were conducted on vehicle types LAND ROVER DEFENDER, HUMMER, UAZ, PINZGAUER and on trucks TAM-110 and TAM-150 in service at the time with the Police and Army of Yugoslavia.

Development of LAZAR multi-role armored combat vehicle

In service with Serbian Army for over twenty years is armored fighting vehicle of BOV family, specialized for use by military police units in various tactical missions of riot control and anti-terrorist operations, designated BOV-3 or VPB M-86. The vehicle was developed based on TAM 150 T7 vehicle chassis elements and fitting of armored hull. Vehicle can transport section of 6-8 military police who can fire small arms from the with permanent crew comprising commander and weapons operator who can fire cal. 7.62mm machine gun M86 with electric trigger from partially armored cupola M86. Vehicle also mounts smoke pot dispenser and folding grill used to subdue riots. Hull armor provides ballistic protection from 7.62 mm AP round fired from distances of more than 100 m.

Jugoimpport-SDPR, as an integrator of Serbian defense industry and in keeping with own development strategy that monitors and analyzes the trends of arms and defense equipment developments and compatibility of noted trends with actual and potential personal, research&development, testing and technological capabilities of Serbian defense industry and its technological partners, has initiated development of a family of multi-role armored vehicles, designed for multiple tactical missions in potential combat environments,

nata šasije vozila TAM 150 T7 sa oklopnim telom, koje obezbeđuje prevoženje odeljenja od 6-8 vojnih policajaca, koji mogu da dejstvuju streljačkim naoružanjem iz vozila, dok stalnu posadu čini komandir i operator naoružanja koji dejstvuje mitraljezom 7.62 mm M86 sa električnim okidanjem iz delimično oklopljene turele M86. Vozilo je takođe opremljeno i bacačem dimnih kutija i preklapajućim rešetkama koje se koriste u suzbijanju nereda. Oklopno telo ovog vozila, obezbeđuje balističkeu zaštiteu od dejstva streljačke pancirne municije kalibra 7.62 mm sa rastojanja od 100 m.

Razvoj višenamenskog oklopnog borbenog vozila "LAZAR"

Jugoimport-SDPR, kao sistem integrator srpske odbrambene industrije, saglasno svojoj razvojnoj strategiji, koja se zasniva na praćenju i analizi trendova razvoja sredstva NVO i kompatibilnosti postojećih trendova sa aktuelnim i perspektivnim kadrovskim, istraživačko-razvojnim, opitnim i tehničko tehnološkim mogućnostima srpske odbrambene industrije i drugih tehnoloških partnera, započeo je razvoj familije višenamesnkog oklopnog vozila namenjenog izvršavanju niza taktičkih zadataka iz domena potencijalnih kategorija oružanih sukoba, namenjen širem dijapazonu potencijalnih kupaca, uključujući i Vojsku Srbije.

intended for wide range of potential customers, including the Serbian Army.

Functional model of the vehicle was completed in 2008 and it is publicly presented for the first time in the pages of this issue or REPORT. Code name of the vehicle is LAZAR, evocating the memory of Prince Lazar who headed Serbian armored cavalry and the entire Serbian army, heroically losing his life in the Battle of Kosovo on St. Vid's day in the year 1389.

In its concept and applied technical solutions, the vehicle is particularly adapted for use by modern infantry units and special forces engaged in missions within anti-terrorist and peacekeeping operations, with emphasis on engagements in urban conditions, settlements and on intersected terrains, in environments involving ambushes, antitank mines and improvised explosive devices set up by an adversary.

The concept of this vehicle practically represents an advanced MRAP, featuring certain properties (mobility, terrain negotiating capability and fire power) of MRAV class combat vehicle, this combining main characteristics of both, nowadays highly important classes of wheeled armored vehicles.

Funkcionalni model vozila urađen je tokom 2008. godine i premijerno se medijski prikazuje na stranicama ovog broja REPORT-a. Vozilo je dobilo naziv LAZAR, evocirajući uspomenu na Kneza Lazara koji je na čelu svojih oklopljenih konjanika i cele srpske vojske herojski poginuo u kosovskoj bici na Vidovdan 1389. godine.

Vozilo je svojim koncepom i tehničkim rešenjima posebno prilagođeno jednicama savremene pešadije i specijalnim jedinicama angažovanim u izvršavanju zadataka u okviru protivterorističkih operacija i mirovnih operacija, sa naročitim akcentom na dejstva u urbanim sredinama, naseljenim područijima i ispresecanom zemljištu, i to u uslovima primene zasednih dejstva protivnika, protivtenkovskih mina, imporovozovanih eksplozivnih naprava.

Koncept vozila praktično predstvalja savremeno vozilo klase MRAP (Mine Ressistant Ambush Protected vehicle), sa nekim karakteristikama (pre svega pokretljivost, tj. vanputna prohodnost i vatrena moć) vozila klase MRAV (Multi Purpose Armored Vehicle), te praktično kombinuje osnovne karakteristike ove dve danas u svetu izuzetno značajne klase oklopnih vozila točkaša.

Pri projektovanju koncepta vozila, poseban akcenat dat je na razvoju visoke pokretljivosti, sistema oklopne zaštite, sistema naoružanja, uz mogućnost prevoženja 10 boraca koji mogu da brzo napuste i ukrcaju se u vozilo iz zaštićene pozicije, primenom zadnjih vrata.

Ukrcano odeljenje smešteno je tako da su borci okrenuti prema velikim prozorima izrađenih od balističkog stakla i puškarnicama, što im omogućava odličnu preglednost, osmatranje okoline i dejstvo ličnim naoružanjem.

Prilikom projektovanja koncepta pogona i oslanjanja vozila, na osnovu dugotrajnog izučavanja i modelovanja mogućih tehničkih rešenja, odabran je princip primene formule 8x8, sa krutim mostovima i oprugama, koji omogućava istovremeno postizanje vrlo visokog nivoa zaštite od dejstava protivtenkovskih mina i improvizovanih eksplozivnih naprava, a uz istovremeno visok nivo prohodnosti vam puteva.

Vozilo je prilikom istitivanja na terenu pokazalo vrlo visok nivo prohodnosti van puteva u različitim terenskom i vremenskim uslovima, vrlo visoku sposobnost savčladavanja uzdužnog nagiba, rovova, kao i, posebno, bočnog nagiba. Vrlo visoka realizovana sposobnost savladavanja bočnog nagiba posebno je značajna kada se ima u vido visoko postavljeno težište vozila uzrokovano potrebom za postizanjem značajnog nivoa protivminske zaštite.

When designing the concept of the vehicle, special emphasis was placed on achievement of high mobility, system of armor protection, armament system, ability to transport 10 infantrymen who should be able to quickly embark or evacuate the vehicle using tail gate.

Embarked section is so accommodated that fighters face large portholes made of ballistic glass equipped with firing ports, ensuring excellent visibility of surrounding terrain and ability to open fire with personal weapons.

When designing the concept of vehicle's propulsion and suspension, after careful study and modeling of feasible technical solutions, it was decided to adopt 8x8 drive, featuring live axles and springs which would provide high level of protection from effects of antitank mines, at the same time ensuring high off-road mobility.

During cross-country testing, the vehicle demonstrated very high off-road mobility in varying terrain and weather conditions, very high ability to negotiate gradients, trenches and, in particular, side slopes. Superior slope negotiating ability is especially important when vehicle's high center of gravity is taken into account, designed so in order to provide better mine protection.

Visok nivo balističke zaštite ostvaren je primenom oklopnog tela izrađenog od pancirnog čelika koje u osnovnoj formi, uključujući i pancirna stakla obezbeđuje zaštitu nivoa III+ (zaštita od metka 12,7 x108 mm B-32 sa 100 m) u skladu sa standardom STANAG 4569 sa prednje strane i nivoa II sa ostalih strana. Primenom kombinovanog dodatnog oklopa složene kompozitne konstrukcije koji se montira na osnovni oklop postiže se balistička zaštita nivoa V sa prednje i IV sa ostalih strana.

Dizajn oklopnog tela omogućava brzo postavljanje i zamenu elemenata dodatnog oklopa od strane posade vozila, čija ugradnja ne degradira osnovne funkcije vozila.

Opciono, primenom eksplozivnog reaktivnog oklopa koji se montira na dodatni oklop postiže se efikasna zaštita protiv pešadijskih protivoklopnih sredstava klase RPG-7, koja danas predstavljaju osnovnu pretnju u navedenim kategorijama borbenih dejstava.

Donji deo oklopnog tela je «V» oblika i u kombinaciji sa velikim rastojanjem od tla i primenom krutih pogonskih mostova obezbeđuje zaštite od eksplozije protivtenkovskih mina i improvizovanih eksplozivnih naprava ispod točka i poda vozila nivoa IIIa (6 kg ispod točka i poda vozila).

Sistem naoružanja vozila je smešten u prostoru između kabine vozača i komandira i prostora za ukrcno odelenje. Koncept vozila omogućava ugradnju šireg spektra turela, kupola i oružnih stanica, u zavisnosti od osnovne namene vozila i planiranog budžeta korisnika.

Najjednostavnije naoružanje sastoji se od delimično oklopljene modularne turele M06 sa montažno-demontažnim postoljima za postavljanje sledećih vrsta naoružanja, alternativno:

mitraljeza 7.62 x 54 mm M86 sa električnim okidanjem;
mitraljeza kalibra 12.7 x 108 mm,
automatskog bacača granata 30 mm.
topa M55 (HS 804) 20 x 110 mm

High level of armor protection was achieved by adopting of steel armor hull that, in its basic version, includes ballistic glass panes and provides protection that meets STANAG 4569, level III+ (protection against 12.7x107 mm B-32 API round fired from 100 m) at front and level II at the sides and rear. By fitting add-on armor of laminated composite structure, attached on basic armor, vehicle ballistic protection is rated level V at front and level IV at all other sides. Armored hull design allows quick fitting and replacement of add-on armor sections by vehicle crew, which, when fitted, do not degrade basic functions of the vehicle.

Optionally, fitting of reactive explosive armor attached to add-on armor will provide effective protection against infantry hand launchers of RPG-7 type which nowadays represent main threat in already mentioned type of warfare.

Hull bottom is V-shaped that, in addition to high ground clearance and solid drive train, ensures very high level of protection from antitank mine and IED, according to level IIIa (resistant against blasts of AT mine or IED containing 6kg of HE occurring under vehicle wheels and floor)

Vehicle armament system is situated in the area between driver's and commander's compartment and area that accommodates embarked troops. Concept of the vehicle allows incorporation of a variety of turrets, cupolas and weapon stations, depending on main application of the vehicle and planned budget of the user.

Simplest armament consists of partially armored modular cupola M06 with detachable mounts, able to support the following weapon alternatives:

- machine gun cal. 7.62 x 54 mm M86 with electric trigger,
- machine gun cal.. 12.7 x 108 mm,
- automatic grenade launcher cal. 30 mm.
- cannon M55 (HS 804) cal. 20 x 110 mm

Existing functional model, as illustrated, mounts light-

Na aktuelnom funkcionlnom modelu, prikazanom na slikama, ugradjena je laka kupola LK08 sa topom 20 x 110 mm M55 (HS804) sa hranjenjem pomoću redenika i mitraljezom 7.62 x 54 mm M86

Koncept omogućava ugradnjuu raznih oružnih stanica sa optoelektronskim sistemom sa upravljanje vatrom i integrisanim sistemom naoružanja koji obuhvata kombinaciju nekih od sledećih vrsta naoružanja

Top 20 mm M55
Top 30 mm M86
Raketni sistem POVR Maljutka 2 sa dvostrukim lanserom
Mitraljez 7.62 mm M86
Mitraljez 12. 7 mm M87
Automatski bacač granata 30 mm M93

Ukupna borbena masa turela/kupola/oružnih stanica iznosi do dve tone, a prečnik ležaja do1600 mm. U svim varijantama turela, kupola ili oružnih stanica,osim navedenog naoružanja, ugrađuju se i 4 bacača dimnih kutija.

Posadu čine tri stalna člana – komandir, vozač i operator naoružanja, kao i pešadijsko odelenje od 10 ukrcnih vojnika – boraca pešadije, odeljenja vojne policije, protivterorističke jedinice, specijalnih jedinica, jednica MUP, žandarmerije itd.

Preklopna sedišta, pričvršćena na krov vozila, omogućavaju veću pokretljivost posade i obezbeđuju dodatnu zaštitu posade od efekata eksplozije mina ispod vozila.

weight cupola LK08 armed with cannon cal. 20 x 110 mm M55 (HS804), with belt feeding, and machine gun cal. 7.62 x 54 mm M86.

The concept permits installation of different weapon stations equipped with optoelectronic fire control system and an integrated weapons system that may consists of a combination the following weapon alternatives:

Cannon cal. 20 mm M55
Cannon cal. 30 mm M86
Wire-guided AT missile system Malutka 2 with twin launcher
Machine gun cal. 7.62 mm M86
Machine gun cal. 12. 7 mm M87
Automatic grenade launcher cal. 30 mm M93

Overall mass of cupola with weapon station is up to two tons, diameter of its support bearing is up to 1600 mm. All versions of the turret, cupola or weapon stations – in addition to listed weapon alternatives – are equipped with 4 dispensers of smoke charges.

Vehicle crew consists of three permanent members – commander, driver and weapons operator – plus embarked section of 10 soldiers – infantrymen, military police, antiterrorist squad, special unit, police or gendarmerie unit, etc.

Folding seats are attached to vehicle roof providing easier crew circulation and added crew protection against effects of blasts under the vehicle.

Embarked section of 10 troops is transported at rear of the vehicle, sitting on folding, ergonomically shaped seats attached to vehicle roof, five men at each side sitting back-to-back and facing the sides of the vehicle, able to observe terrain through

Iskrcno odeljenje od deset ljudi se prevozi u zadnjem delu vozila sedeći na preklapajućim zasebnim ergonomski projektovanim sedištima pričvršćenim za krov vozila, i to po pet boraca sa svake strane vozila, okrenuti leđima jedan prema drugome i sa mogućnošću osmatranja terena kroz prozore izrađene od balističkih stakala i dejstvo streljačkim naoružanjem - automatskim jurišnim puškama, puškomitraljezima, ručnim bacačima granata 40 mm kroz ugrađene puškarnice postavljene ispod prozora. Raspoloživi prostor omogućava nesmetano ukrcavanje, iskrcavanje i udoban smeštaj boraca opremljenih punom balističkom zaštitom uključujući balističke zaštitne prsluke sa balističkim pločama i taktičke prsluke sa municijom i drugom opremom. U prostoru između kabine vozača i komandira i ukrcnog odelenja, sa leve i desne strane korpe kupole, odnosono mesta operatora oružnom stanicom, načlazi se prostor za smeštaj različitog pešadijkskog naoružanja ručnih protivoklopnih lansera, prenosnih sistema vođenih protivtenkovskih raketa, odnosno prenosnih raketnih sistema PVO i sl.

Ulazak i izlazak posade iz vozila obavlja se kroz zadnja vrata, koja su takođe opremljena prozorima i puškarnicama i koja omogućavaju ukrcavanje celokupnog odeljenja za oko 10 sekundi. i njihovo smeštanje u sedišta, dok se u cilju prinudnog izlaza mogu koristiti i otvori na krovu vozila.

Prema zapažanjima korisnika iskazanih prilikom upoznavanja sa vozilom, vozilo LAZAR pruža mogućnost udobnog prevoženja, odličnu preglednost, brzu i laku obuku vozača, nesmetanu i efikasnu upotrebu ličnog naoružanja, značajnu vatrenu podršku iskrcanog ljudstva dejstvom ugrađenog naoružanja, nesmetano i brzo iskrcavanje i ukrcavanje, kao i, što je veoma značajno, pruža osećaj sigurnosti i dominacije na bojištu.

Osnovni koncept vozila predstavlja osnovu za razvoj familije vozila, koja obuhvata različite verzije – komandno vozilo, ambulantno vozilo, vozilo namenjeno logističkoj podršci (kargo vozilo), vozilo inženjerijsko/tegljač, protivminsko vozilo, kao i osnovu za samohodni minobacač 120 mm, samohodno artiljerijsko oruđe 122 / 155 mm, artiljerijski, raketni ili hibridni (artiljerijsko-raketni) sistem PVO i drugo.

portholes of ballistic glass and to fire personal weapons – assault rifles, light machine guns or grenade launchers cal. 40 mm – through firing ports situated below lookout ports. The space available permits easy embarking, evacuation and comfortable accommodation of soldiers wearing full ballistic protection including protective vests with ballistic plates and tactical vests with ammunition and other gear. Space between driver's and commander's compartment and embarked crew area, left and right from turret basket i.e. from weapon operator's station, serves as storage bay for a range of infantry weapons, antitank hand launchers, portable antitank wire guided missile systems, portable air defense missile launchers, etc.

The crew enter and exit the vehicle through tailgate which is also provided with portholes and firing ports and enables embarking or disembarking of complete crew in about 10 seconds including their taking of seats. There are also two side doors, plus two emergency roof hatches.

Observations made by the user during demonstration of the vehicle noted that armored vehicle LAZAR provides comfortable transport, excellent visibility, quick and easy driver training, unhindered and effective use of personal weapons, significant fire support provided by disembarked section using the complement of weapons carried on board, unhindered and rapid disembarking and embarking and, an important impression, feeling of security and domination in the battlefield.

Basic concept of the vehicle represents the foundation for building up its different versions – command vehicle, medical evacuation, logistic support (cargo) vehicle, engineering /recovery vehicle, mine clearing vehicle, as well as platform for self-propelled mortar cal. 120mm, self-propelled artillery piece cal. 122/155mm, artillery, rocket or hybrid (artillery/rocket) or air defense system, etc.

Special equipment (on customers' request)

- Air-conditioning employing compressor split system,
- VHF radio set of 15W output, with UMR
- Filtering-ventilating system creating overpressure within

OSNOVNI TEHNICKI PODACI:	
Vozilo	LAZAR BVT 8808-SR MRAP
Platforma	sasija 8 x 8 velike pokretljivosti
Motor	400 do 440 KS
Menjač	mehanicki, sinhronizovan (opciono automatska transmisija)
Sistem upravljanja	mehanicki sa hidropojacivacem, dva prednja mosta su upravljacka
Vešanje	2x2 tandem; sa hidraulickiom amortizerima i lisnatim oprugama,
Gume	Širokoprofilne, sa profilom gazećeg sloja za terensku eksploataciju, sa centralnom regulacijom pritiska, opciono RUN FLAT ulošci
Instalacija za centralnu regulaciju pritiska u pneumaticima opseg regulacije pritiska	0,19-4,8 bar
Kočnica	pneumatska, dvokružna sa ABS uređajem
Vitlo za samoizvlačenje	10 t.
Električna instalacija	napon 24V, 2 akumulatorske baterije
Sopstvena masa vozila	16.3 t
Maksimalna masa vozila sa dodatnom oklopnom zaštitom	28 tona
Visina do krova oklopnog tela	2.450 mm
Dužina	7.250 mm
Širina	2.400 mm
Razmak osovina	1.500+2.000+1.400 mm
Trag točkova	2.050 mm
Najmanja visina iznad tla	430 mm
Maksimalna brzina (km/h)	90 km/h
Autonomija kretanja vozila	600 km
Maksimalno savlađivanje podužnog nagiba	60%
Maksimalno savlađivanje bočnog nagiba	30%
Prilazni ugao, prednji	58˚
Prilazni ugao, zadnji	75˚
Visina vertikalne prepreke	0.63 m
Vodeni gaz, maksimalni	1,3 m
Maksimalna širina rova	2 m

Specijalna dodatna oprema (po zahtevu Kupca)

• Klimatizacija, kompresor, split sistem
• VVF radio uređaj, snage 15W, sa UMR
• Uređaj za filtroventilaciju za stvaranje natpritiska u oklopnom telu, filter za prečišćavanje vazduha za ABH zaštitu
• Komandno informacioni sistem (KIS) sa navigacionim sistemom baziranim na GPS
• Panoramska optoelektronska izviđačko-osmatracka stanica, stabilizovana u dve ravni, sa CCD TV kamerom, termovizijskom kamerom i laserskim daljinomerom

Komandno informacioni sistem (KIS) predstavlja hardversko i softversko rešenje koje omogućava komandiru/komandantu jedinice podršku u planiranju i pripremi misije, donošenju odluka, organizaciji, pripremi izveštaja, slanju naredbi, uočavanju i određivanju položaja ciljeva i sličnim aktivnostima vezanim za borbene aktivnosti.

Osnovne funkcije KIS

Prikazivanje položaja sopstvenog i drugih vozila na situacionoj mapi,
Podrška u planiranju misije,
Određivanje sopstvenog položaja i navigacija
Komunikacija sa pretpostavljenim i sadejstvujućim jedinicama
Razmena podataka
Učešće u proceduri određivanja cilja, praćenja cilja i izvršenja gađanja

the hull, air-filtering system including CBR protection
• Command information system (KIS) with GPS based navigation
• Panoramic optoelectronic reconnaissance-observation station, stabilized in two planes, fitted with CCD TV camera, thermal imaging camera and laser rangefinder

Command information system (KIS) is a hardware/software device that provides support in mission planning and preparing to unit commanding officers, their decision making, organization, preparing of reports, issuing of orders, locating of target positions and similar activities related to combat activities.

Main functions of KIS

- Presentation of own position and positions of other vehicles on situation chart,
- Mission planning support,
- Determining of own position and navigation,
- Communication with superior and coordinating units,
- Exchange of information,
- Participation in target locating, tracking and firing engagements.

The main techical data	
Vehicle	LAZAR BVT 8808-SR MRAP
Platform	high mobility chassis 8 x 8
Engine	400 to 440 HP
Gearbox	Mechanical synchronized (optional automatic)
Axles steering	Mechanical with hydraulic amplifier, two front steering axle
Suspenison	2 x 2 tandem axles; leaf springs and shock absorbers,
Tyres	Wide profiled, with tread pattern for Off road operation , with Central Pressure Regulation (RUN FLAT insert optional)
Installation for central pressure regulation-Pressure regulation range in the tyres	0,19-4,8 bar.
Brake	Pneumatic, dual circuit, with ABS
Winch device	10 t
Electric installation	Rated voltage-24 V, 2 batteries
Weight of unloaded vehicle	16.3t
Max. Weight with add-on armor protection	28 t
Height (up to armored hull roof)	2450 mm
Length	7250 mm
Width	2400 mm
Wheelbase	1500+2000+1400
Wheeltrack	2050 mm
Clearance	430 mm
Maximum speed (km/h)	90 (km/h)
Autonomy	600 km.
Gradient max.	60%
Side slope max	30%
Approach angle	58˚
Departure angle	75˚
Vertical obstacle max	0,63 m
Fording, max	1.3 m
Trenching max	2 m

105 mm M56 A1 long range gun-howitzer

- Light weight and compact design
- Compatile with all types of NATO ammunition
- 18.5 km with new HE-ER BB projectile (with base bleed unit)
- 15 km with new HE-ER BT (boat-tail) projectile
- 33-caliber barrel

YUGOIMPORT-SDPR

BORBENI BALISTIČKI PRSLUCI JUGOIMPORT-SDPR

Piše
Dragan Rakić

Pripadnici Vojske Srbije, kao i pripadnici jedinica MUP Republike Srbije su se, imajući u vidu njihovo učešće u raznim kategorijama oružanih sukoba vođenim tokom 90-ih godina uverili u veliki značaj borbenih prsluka za uspešno izvršavanje niza zadataka sa kojima se susreću savremene pešadijske, specijalne i policijske jedinice u različitim kategorijama oružanih sukoba. U Republici Srbiji borbeni balistički prsluk (Prsluk), koji obuhvata: borbeni prsluk (BP) (često se ovaj prsluk naziva i taktički prsluk), zaštitni balistički prsluk (ZBP) i balističke zaštitne ploče (BZP), različitih nivoa zaštite, trenutno serijski proizvode nekoliko firmi:

BULLETPROOF VESTS YUGOIMPORT-SDPR

By
Dragan Rakić

Having been involved in various armed conflicts during the nineties, the Serbian Army and Police units (Ministry of Interior of the Republic of Serbia) realized the great importance of combat vests for successful carrying out of a number of missions with which modern infantry, special and police forces are faced in various categories of armed conflicts. In the Republic of Serbia, the combat bulletproof vest - including combat vest (often called tactical vest), protective bulletproof vest (insert) and bulletproof protective plate of various protection levels - is currently produced by several companies:

"Mile Dragic Production" from Zrenjanin, producing combat vests, bulletproof protective panels, camouflage equipment etc. The company has the longest tradition in the production of personal protection equipment,

"BAPS" from Zrenjanin, producing also full set of personal protection equipment. It cooperates with the ARES group and has vast experience in the field of manufacture of bulletproof protective plates,

"ALEKS ARMOR" from Belgrade, producing bulletproof protective panels on a smaller scale. They produce bulletproof vests in cooperation with other companies, especially with the UNO MARTIN company,

"OZMOARMOR" from Belgrade – Mladenovac produces bulletproof panels only. They also deal with vehicle armour,

"KLUZ" from Belgrade, producing parachutes, protective bulletproof vests and suits for the Army and the Police,

"JUMKO" from Vranje, producing textile garments for the Army,

UNO MARTIN VM Protection from Šabac, which produced protective bulletproof vests, and bulletproof inserts in cooperation with the ALEKS ARMOR company

UNO MARTIN HOME from Smederevo, which produced vests, and bulletproof inserts in cooperation with the ALEKS ARMOR company,

INSITITUE OF SECURITY (BIA) organized production of bulletproof panels, but their main field of activity was in the ceramic plates and vehicle armour.

The above listed companies produce vests as per their own technical and technological documentation, predominantly for export purposes, while Mile Dragic Production manufactures vests and protective plates for the Military and Police, in accordance with the tactical and technical requirements of the Serbian Military, also as per its own documentation.

"Proizvodnja Mile Dragić" iz Zrenjanina. Proizvodi borbene prsluke, balističke zaštitne ploče, maskirnu opremu i dr. Firma ima najdužu tradiciju u proizvodnji opreme za ličnu zaštitu,

"BAPS" iz Zrenjanina. Proizvodi, takođe kompletnu opremu za ličnu zaštitu. Sarađuje sa grupacijom ARES . Poseduje najveće iskustvo u području izrade balističkih zaštitnih ploča,

"ALEKS ARMOR" iz Beograda. Proizvodi balističke zaštitne ploče u manjem obimu. Zaštitne balističke prsluke radi u koperaciji, pre svega sa firmom UNO MARTIN,

"OZMOARMOR" iz Beograda- Mladenovca. Proizvodi, takođe samo balističke zaštitne ploče. Radi i na oklopljavanju vozila,

"KLUZ" – Beograd proizvodi padobrane, zaštitne balističke prsluke, odela za potrebe Vojske i Policije,

"JUMKO" Vranje. Proizvodio je tekstilnu opremu za Vojsku,

UNO MARTIN VM Protection- Šabac. Proizvodio je zaštitne balističke prsluke, s tim što je balistički uloške radio u kooperaciji sa firmom ALEKS ARMOR,

UNO MARTIN HOME - Smederevo, Proizvodio je Prsluke, s tim što je balističke uloške radio u koperaciji sa firmom ALEKS ARMOR,

INSTITUT BEZBEDNOSTI BIA. Organizovao je izradu balističkih prsluka, s im da se bavio, pre svega zaštitnim keramičkim pločama, kao i oklopljavanjem vozila.

The characteristics of the vests and protective plates, as well as the methodology of quality control and testing are specified in the pertaining technical documentation and standards.

Protective properties of the vest are tested in Serbia as per the following international standards: NIJ 0101.03 and NIJ 0101.04 (modified in 2001), NATO standard STANAG 2920, European standard EN 1063, Chinese standard GA 165, German standard DIN 52290 and Russian standard GOST R50963-96.

DESCRIPTION OF THE TECHNICAL SOLUTION AND MATERIALS THAT CAN BE USED FOR MANUFACTURE OF BULLETPROOF VESTS - YUGOIMPORT-SDPR

Description of the technical solution

The basic model of the combat vest developed by Yugoimport-SDPR and produced in cooperation with the technological partner in this project is shown in Figure 1-a. This combat vest can be produced in various camouflage patterns, the vest shown in the Figure below being made in the desert camouflage pattern, with six pouches or pockets (four for ammunition magazines and two for hand grenades and other equipment). The vests are produced in the following sizes: Large, XLarge, XX Large and XXXLarge.

The basic model of the protective bulletproof vest has IIIA level of protection as per NIJ 0101.04. The front is fitted with a 330 h 390 mm bulletproof insert, and the back with 330 x 410 mm bulletproof insert.

The bulletproof insert is composed of multi-layered bulletproof cloth made of aramid fibers or of high density polyethylene (Dyneema, Kevlar, Spectra, Twaron and other synthetic materials). The number of cloth layers composing the insert will depend on the quality of the materials used. These vests are contracted for supply in sizes Large, XLarge, XXLarge and XXXLarge, but for all the vest sizes the inserts will be the same size.

The outline of the protective bulletproof plate, contracted for delivery to the end user is shown in Figure 2. These plates are placed in specially prepared pockets in the front and the back of the protective bulletproof vest (in front of the inserts). They are designed so as to adjust to the body, and are designated as per NIJ 01.01.04 and technical documentation.

Materials that can be used for production of the combat bulletproof vest

Combat vests are usually produced of Cordura rayon 500 or Ripstop, 50% cotton and 50% polyester, and are impregnated and waterproof on the outside.

Navedene firme proizvode Prsluke po sopstvenoj tehničkoj i tehnološkoj dokumentaciji, pretežno za potrebe izvoza, dok Proizvodnja Mile Dragić proizvodi Prsluke i Zaštitne ploče i za potrebe Vojske i Policije, u skladu sa Taktičko tehničkim zahtevima koje je izdala Vojska Jugoslavije, takođe po sopstvenoj dokumentaciji.

Karakteristike Prsluka, uključujući i zaštitne ploče, metodologiju provere kvaliteta i ispitivanja definisani su odgovarajućom tehničkom dokumentacijom i standardima.

Za proveru zaštitnih karakteristika Prsluka u Srbiji koriste se međunarodni standardi: NIJ 0101.03 i NIJ 0101.04 (modifikovani 2001. godine), zatim NATO standard STANAG 2920, evropski standard EN 1063, kineski standard GA 165, nemački standard DIN 52290 i ruski standard GOST R50963-96.

OPIS TEHNIČKOG REŠENJA I MATERIJALI KOJI SE MOGU KORISTITI ZA IZRADU BALISTIČKIH BORBENIH PRSLUKA JUGOIMPORT-SDPR

Opis tehničkog rešenja

Izgled osnovnog moela borbenog prsluka razvijenog u Jugoimport-SDPR i proizvedenog na bazi proizvodne kooperacije sa tehnološkim partnerima u projektu je na sl. 1-a. Navedeni borbeni prsluk može biti proizveden u raznim maskirnim dezenima, a prsluk na slici izveden je u pustinjskom maskirnom dezenu, i ima 6 raznih futrola, odnosno džepova (4 za smeštaj okvira za municiju i 2 za smeštaj ručnih bombi i druge opreme). Ovi prsluci se proizvode u sledećim veličinama: Large, XLarge, XXLarge i XXXLarge.

Osnovni model zaštitnog balističkog prsluka Prsluk je sa nivoom zaštite IIIA prema zahtevima iz međunarodnog standarda NIJ 0101.04. Sa prednje strane ima balistički uložak (uložak) dimenzija 330 h 390 mm, a na leđnom delu uložak 330 x 410 mm.

Balistički uložak se formira od balističkog višeslojnog platna izrađenog od aramidnih vlakana ili polietilena visoke molekularne gustine (Dynema, Kevlar, Spectra,Twaron i drugi sintetički materijali). Kvalitet upotrebljenih materijala definiše i broj slojeva tkanine od kojih se formira uložak. I ovi prsluci su ugovoreni za isporuku u veličinama Large, XLarge, XXLarge i XXXLarge, s tim što su za sve veličine prsluka balistički ulošci istih dimenzija. Isporuku ovih prsluka treba realizovati u navedenim veličinama u istim odnosima kao i borbene prsluke..

Izgled balističkih zaštitnih ploča, ugovorenih za isporuku Krajnjem korisniku dat je na sl. 2. Navedene ploče se postavljaju u posebno pripremljene džepove na

Protective bulletproof vests are made of the same cloth as combat vests.

Bulletproof inserts

The protection level of the bulletproof insert defines the minimum absorbtion energy the insert should have.

Bulletproof inserts can be made of the following material layers (materials for the so called «soft» ballistics): Kevlar, Dyneema or Spectre or combinations of Dyneema and Kevlar (hybrid).

The exact number of layers of which the bulletproof insert is composed of depends on the type and the quality of the material used (Kevlar Comfort XLT, Kevlar 129, and Kevlar KM2 etc.).

The value that features the quality of all these materials is the „specific energy of absorption“(SEA). SEA is the kinetic energy of absorption inherent to a piece of bulletproof material of unit aerial density expressed in Jm2/kg.

When SEA for the given material and the areal density of a layer of this material are known, the exact number of layers can be determined in order to achieve the required level of protection.

Another way to determine the number of layers (if SEA value is not known) is to experiment and determine the number of layers necessary to form the bulletproof insert.

Kevlar was the first material used for manufacture of vests and it revolutionized personal protection. Kevlar is made in different qualities. For bulletproof inserts, Kevlar with the specific mass of

zaštitnom balističkom prsluku, s njegove prednje i zadnje strane (ispred balističkih uložaka). One su konstruisane tako da su prilagođene prednjem i zadnjem obliku tela, sa tačno obeleženim natpisima i skladu sa standardom NIJ 01.01.04 i tehničkom dokumentacijom.

Mogući materijali koji se koriste za izradu balističkog borbenog prsluka

Borbeni prsluci se, najčešće, izrađuju od tkanine Kordura 500 ili Ripstop sa 50% pamuka i 50% poliestera, sa lica vodoodbojne i vodootporne (impregnirane, nepromočive).

Zaštitni balistički prsluci (sl.1- b) izrađuju se od tkanine kao i borbeni prsluk.

Balistički ulošci

Nivo balističke zaštite balističkih uložaka definiše minimalnu energiju apsorpcije koju balistički uložak mora da poseduje.

Balistički ulošci dimenzija mogu se izrađivati od slojeva sledećih materijala (materijala za tzv. «meku» balistiku): Kevlara, Dyneeme ili Spectre ili kombinacije Dyneeme i Kevlara (Hibrid).

Tačan broj slojeva od kojih se formira balistički uložak zavisi od vrste i kvaliteta upotrebljenog materijala (Kevlar Comfort XLT, Kevlar 129, Kevlar KM2 i dr.).

Podatak koji jednoznačno balistički karakteriše kvalitet svih ovih materijala je „specifična energija apsorpcije“ (SEA). SEA je kinetička energija apsorpcije koju poseduje komad balističkog materijala jedinične površinske mase i izražava se u (Jm2/kg).

Poznavanjem SEA za konkretni materijal i površinske mase sloja tog materijala može se tačno utvrditi broj slojeva potrebnih za ostvarenje traženog nivoa zaštite.

Drugi način je (ukoliko do vrednosti SEA nije moguće doći) eksperimenalnim putem utvrditi broj slojeva od kojih će biti formiran balistički uložak.

Kevlar je prvi materijal koji je korišćen za izradu prsluka i doneo je pravu revoluciju u balističkoj zaštiti. Kevlar se izrađuje u različitim kvalitetima. Za balističke zaštitne uloške, najčešće se koristi Kevlar specifične mase od 280 gr/m2.

Kevlar se isporučuje u obliku preprega. Osetljiv je na vlagu te je neophodno da spoljni deo prsluka bude od obične nepromočive tkanine, koja štiti i od UV zraka.

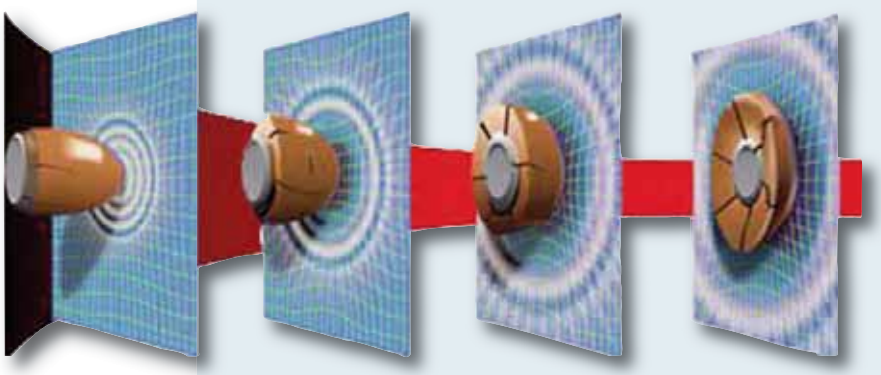
280 gr/m2 is usually used. It is supplied in the form of prepreg. Being moisture sensitive, the outer part of the vest has to be made of ordinary waterproof cloth which also blocks the UV rays. The protective multi-layers are not to be stiched since this would reduce the protective properties. Lower density provides for better protection. The IIIA level of protection is achieved with approximately 30-36 layers.

Dyneema is also one of the materials that has been increasingly used for manufacture of bulletproof vests. Dyneema is moisture resistant, has no life limitations, but it is sensitive to high temperatures (over 750C). The quality of the material defines the number of layers forming the insert. Dyneema does not need an outer cloth, but it is nevertheless used for UV and damage protection. One of the well-known types of this material is Dyneema SB 21,...

Bulletproof inserts can be made of a combination of Dyneema and Kevlar (the so called hybrid). The materials can be combined in different ways, such as Dyneema in the front, Kevlar in the back and vice versa, or both sides of the vest can have combinations of these materials in the proportion that provide for best protection and price.

Bulletproof protective plates, protection level III, weight 1450±5% g, size 250h300 mm, curved with the radius of 400 mm at 250th milimeter, can be made only of materials with the SEA of minimum 166.05 Jm2/kg.

These are mainly polyethylene materials with ultra high molecular weight (for the so called “hard» ballistics), with the trade name Dyneema, Spectra (producers: DSM Dyneema, Netherlands, Spectra Shield Honeywell – USA, MDA Izrael....). The plate thickness depends on the quality of the material used.



Zaštitni višeslojni deo ne sme se prošivati jer se time smanjuju njegove zaštitne karakteristike. Manja gustina obezbeđuje bolju zaštitu. Nivo zaštite IIIA obezbeđuje sa oko 30-36 slojeva..

Dyneema su takođe materijali koji se u poslednje vreme sve više koriste za izradu balističkih prsluka. Dyneema je otporna na vlagu, nema ograničen vek trajanja ali je osetljiva na povišene temperature (preko 750C). Kvalitet upotrebljenog materijala definiše i broj slojeva tkanine od kojih se formira uložak. Za Dyneema nije neophodna spoljna tkanina ali se koristi zbog UV zaštite i mogućih oštećenja.

Među poznatijim vrstama ovog materijala je Dyneema SB 21, ...

Za izradu balističkih uložaka može se koristiti i kombinacija materijala Dyneema + Kevlar (takozvani hibridni sistem). Kombinacije mogu biti različite kao npr. prednja strana od Dyneema, zadnja strana od Kevlara ili obrnuto, ili pak kombinacijom slojeva navedenih materijala sa obe strane prsluka u odnosima koji daju najoptimalniju zaštitu sa aspekta cene.

Balističke zaštitne ploče nivoa zaštite III, mase 1450±5% gr., dimenzije 250h300 mm, zakrivljene sa radijusom od 400 mm na koti od 250 mm, mogu se izrađivati samo od materijala čija je SEA minimalno 166.05 Jm2/kg.

Dyneema and Spectra are the materials that are used, due to their technical and technological characteristics, solely for manufacture of bulletproof plates with level III protection. The use of these materials provides for the most favorable ratio between the total weight and protective properties. The manufacturers of these materials have developed several types of these materials that are in serial production (Dyneema HB2, HB25, HB26, HB50, HB51). The exact type that can be used for making the contracted plate with level III protection can be defined after obtaining reliable information on the possiblity for supply of the required material quantities.

Production of combat protection vests

Production of the contracted quantities of combat vests has been organized in cooperation with indigenous subcontractors, or with foreign companies with long experience, necessary equipment and skilled manpower for production of the contracted quantities of these vests. Having in mind that the vests contracted for with the end user are in sizes Large, XLarge, XXLarge and XXXLarge, it was agreed that YI SDPR should make all the patterns and submit the technical properties of the materials to the manufacturers, make the samples, and upon their testing and verification, submit the patterns to the manufacturers for production. In order

To su uglavnom materijali izrađeni od polietilena ultra visoke molekularne mase (materijali za tzv. „tvrdu“ balistiku), trgovačkog naziva Dyneema, Spectra (prizvođači: DSM Dyneema, Netherlands, Spectra Shield Honeywell – USA, MDA Izrael ...). Debljina ploče zavisi od kvaliteta upotrebljenog materijala za njenu izradu.

Dyneema i Spectra su materijali koji se zbog svojih tehničkih i tehnoloških karakteristika isključivo koriste za izradu balističkih ploča, nivoa zaštite III. Upravo korišćenjem ovih materijala postiže se najpovoljnij odnos između ukupne mase i zaštitnih karakteristika. Ovde treba istaći da su proizvođači ovih materijala do sada razvili i nalaze se u serijskoj proizvodnji po nekoliko tipova ovih materijala (Dyneema HB2, HB25, HB26, HB50, HB51,...) i tačan tip koji bi se mogao upotrebiti za izradu ugovorene ploče nivoa zaštite III može se definisati nakon obezbeđenja pouzdanih informacija o mogućnosti isporuke materijala u potrebnim količinama.

Proizvodnja borbenih zaštitnih prsluka

Proizvodnja ugovorenih količina borbenih prsluka organizovana je u saradnji sa domaćim kooperantima, ili sa firmama iz inostranstva, koje imaju dovoljno iskustva, potrebnu opremu i stručnu radnu snagu za proizvodnju ugovorenih količina ovih prsluka. Imajući u vidu da je sa Krajnjim korisnikom ugovorena isporuka ovih Prsluka u veličinama: Large, XLarge, XXLarge i XXXLarge, ugovoreno je da JI-SDPR za sve ugovorene veličine izradi šablone, dostavi proizvođačima tehničke karakteristike materijala, izradi probne uzorke, i nakon ispitivanja, odnosno verifikacije uzoraka, šablone dostavi proizvođačima na izradu. U cilju obezbeđenja zahtevanog kvaliteta i lakšeg praćenja pouzadnosti kompletnog proizvodnog procesa, vođenje kompletne dokumentacije za ukupne količine koje treba isporučiti Krajnjem korisniku, ugovoreno je da se razmotri varijanta da se izrada borbenih prsluka ugovori sa proizvođačima tako što će, po mogućnosti, svaki proizvođač da radi po jednu (maksimalno do dve) veličinu borbenih prsluka.

SDPR vrši centralizovanu nabavku osnovnog i pomoćnog pribora. JI SDPR bi trebalo da sa odabranim proizvođačima osnovnog i pomoćnog pribora izvrši usaglašavanje kvaliteta (dezen, boja, nepropustljivost i druge bitne tehničko tehnološke karaktetristike). Za svaku veličinu ugovorenih prsluka u organizaciji JI SDPR-a izrađeni su šabloni, na osnovu kojih je izrađen po jedan uzorak i nakon verifikacije uzorka, šablone dostavljeni proizvođačima na dalju realizaciju.

to provide for the required quality and to enable easier monitoring of the production process and making of documentation for the entire quantity to be delivered to the end user, it was agreed to see to the possibility that each producer makes one size (or maximum two) of the combat vests.

SDPR is responsible for the centralized purchase of the main and auxiliary equipment. YI SDPR is also to harmonize the quality with the selected manufacturers of the main and auxiliary equipment (pattern, color, waterproof properties, and other important technical and technological characteristics).

BORBENE ČIZME ZA PEŠADIJU AHIL M98A1 – ZAŠTITA OD PROTIVPEŠADIJSKE NAGAZNE MINE

Piše
Aleksandar Lijaković

M98A1 ACHILLES je najnovija, usavršena verzija srpskog domaćeg dizajna vojničkih borbenih čizama sa jedinstvenom karakteristikom – obezbeđuju zaštitu stopala od svih standardnih protivpešadijskih nagaznih mina koje sadrže do 45g TNT. Po svom spoljašnjem izgledu i osobinama (težina, opšti ergonomski aspekti, udobnost za stopalo i pokretljivost vojnika, izdržljivost, vodootpornost, itd.) ova čizma pripada savremenom dizajnu modernih borbenih čizama namenjenih teškoj pešadiji ili borbenim zahtevima specijalnih jedinica u raznim klimatskim uslovima i terenima.

Zbog ovih karakteristika, čizma AHIL M98A1 predstavlja izbor jedinica pešadije širom sveta i niza specijalnih jedinica. Sposobnost zaštite od protivpešadijske mine postala je izuzetno važna karakteristika borbenih čizama na početku 21. veka, s obzirom na sve veće opasnosti od protivpešadijskih mina u današnjem svetu i njihovu sve veću upotrebu u brojnim manjim sukobima, uključujući protivpobunjenički i antiteroristički način ratovanja, građanske ratove, operacije za uspostavljanje/održavanje mira, kao i u operacijama rešavanja kriza.

Pored osnovne primene – upotrebe u borbi, čizme AHIL M98A1 mogu biti veoma važna oprema za različite civilne organizacije (posebno humanitarnog karaktera) koje su u većini slučajeva izložene delovanju pritajene i zastrašujuće opasnosti od protivpešadijskih mina.

M98A1 ACHILLES COMBAT BOOTS, INFANTRY,WITH ANTI- PERSONNEL CONTACT MINE PROTECTION CAPABILITY

By
Aleksandar Lijaković

M98A1 ACHILLES is the latest improved version of Serbian indigenous design of combat military boots with a unique feature – providing foot protection against all standard anti-personnel contact mines containing up to 45 gr of TNT. According to its outer appearance and characteristics (weight, general ergonomic aspects, foot comfort and soldier mobility, durability, water-resistance, etc.) this boot belongs to up-to-date design of modern combat boots intended for heavy infantry or special operation forces combat requirements in various climates and ground conditions.

These features make M98A1 ACHILLES footwear-of-choice for worldwide members of infantry units and a wide range of special operation forces.

Anti-personnel mine protection capability has become an extremely important characteristic of combat boots at the beginning of 21st century in view of the growing threat of AP mines nowadays and its ever increasing use in numerous low-intensity conflicts, including antiguerrilla warfare, antiterrorist warfare, civil wars, peacekeeping/ peace-making operations, as well as in crisis management operations etc.

In addition to the primary application-combat use, the M98A1 ACHILLES boots can be very important equipment for diverse civilian organizations (humanitarian, in particular) which are in many cases exposed to the action of silent and horrifying threat of anti-personnel mines.

Imajući u vidu milione ovakvih sredstava postavljenih po mnogim kriznim područjima širom sveta (podsaharska Afrika, južna i jugoistočna Azija, Balkan itd.), ove čizme treba da postanu nezamenljivi deo opreme svakog vojnika i člana humanitarnih organizacija.

Zaštita od protivpešadijskih mina zasniva se na jedinstvenom zaštitnom sistemu apsorpcije udarnog talasa, koji se pak zasniva na kombinaciji:

Jedinstvenog i dugotrajnog gumenog đona velike otpornosti, sa vazdušnim komorama

i višeslojnim pločama od čeličnih legura i slojeva aramidnih vlakana

Masa jedne čizme prosečne veličine (dužina stopala 28 cm) je 1,2 kg (2,4 kg po paru)

Čelične ploče su napravljene od čeličnih legura optimalnih mehaničkih karakteristika, naročito visoke čvrstoće na istezanje i izdržljivosti. Iako je velika pažnja posvećena izradi zaštite, ove čizme takođe omogućavaju slobodno i udobno pokretanje stopala.

U slučaju direktnog kontakta sa protivpešadijskom minom koja sadrži do 45g TNT-a, čizma će biti ozbiljno oštećena (neupotrebljiva), ali će stopalo vojnika pretrpeti lake ili manje povrede. U zavisnosti od uslova udara, moguć je niz lakših ili umerenih povreda – od manjih modrica na prstima i stopalu, otoka i istezanja zgloba, do preloma prstiju i cevanice. U zavisnosti od nivoa povrede, vojnik će moći da se vrati u svoju jedinicu nakon oporavka od nekoliko nedelja do nekoliko meseci.

Postupak testiranja zasniva se na simulaciji uslova udara korišćenjem odgovarajuće, posebno napravljene opreme, od materijala koji simuliraju čvrstoću i otpor ljudskog stopala. Osnovni kriterijum za prijemno ispitivanje čizme je izbegavanje oštećenja čelične ploče koja je u dodiru sa stopalom i materijala koji simulira otpor stopala.

Having in mind millions of pieces of such weapons, dispersed in many crisis areas all over the world (Sub-Saharan Africa, South and South-East Asia, the Balkans, etc.), these boots should become an irreplaceable part of equipment of any soldier and member of humanitarian organizations.

Anti-personnel mine protection design is a unique shock-wave absorbing protection system, based on the combination of:
Unique, high-resistant and long lasting rubber sole, which includes integrated air chambers, integrated multi-layer steel alloy plates protection system, and Aramid fiber layers

The weight of an average size single boot (foot length 28 cm) is 1.2 kg (2.4 kg per pair)
The steel plates are made of steel-alloy with optimized mechanical characteristics, particularly with high tensile strength and durability. Although particular attention has been paid to protection design, these boots also ensure free and comfortable foot movement.

In case of direct contact with AP mine containing up to 45 g of TNT, the boot would be severely damaged (unusable), but the soldier's foot would sustain light or moderate injuries. Depending on impact conditions, a range of light or moderate injuries is possible- from light toe and foot bruises and contusion and ankle sprain to toe breaking and shinbone fracture. Depending on injury level, a soldier will be able to return to his unit after a period of few weeks to few months of rehabilitation.

Testing procedure is based on simulation of impact conditions by using appropriate specially designed testing equipment which includes materials simulating human foot strength and resistance. The main acceptance criteria are avoiding of damaging of the steel plate in contact with the soldier's foot and of the material simulating foot resistance.

Model AHIL M98A1 predstavlja najnoviju verziju modela borbenih čizama M98 isprobanog u borbi. Kod modela M98A1 poboljšana je udobnost za stopalo i obezbeđena je bolja pokretljivost vojnika. Razvoj čizme je završen, čizma je u potpunosti ispitana u najtežim uslovima i zvanično je prihvaćena i atestirana od strane Tehnički opitni centar Oružanih snaga Srbije.

Serijska proizvodnja osnovnog modela M98 za Oružane snage Srbije počela je 1998. Model se takođe izvozio pojedinim jedinicama mirovnih snaga UN. Osnovni model je isproban u borbi u brojnim situacijama gde su vojnici bili izloženi direktnom dejstvu protivpešadijskih nagaznih mina proizvedenih u bivšoj Jugoslaviji, sa oznakom PMA-3, koje sadrže 35 g RDX (što odgovara 46,6 g TNT-a) u različitim uslovima udara, a bez ikakvih teških povreda stopala.

Prema nekim egzaktnim zahtevima koji se postavljaju pred konstrukciju protivminske zaštitne pešadijske čizme nastalim na bazi sanitetsko-medicinskih istraživanja obavljenim u oružani snagama zemalja nekih ino-kupaca, maksimalni pritisak koji stopalo direktno trpi prilikom kontakta /eksplozije protivpešadijske nagazne mine uz zadovoljenje uslova da ne dođe do značajnijih povreda-razaranja tkiva jeste 200 Bara, a uz toleranciju od 10%, što znači da maksimalni tolerisani pritisak prema zahevima kupaca, odnosno rezultatima istraživanja dostiže 220 Bara. Radi ilustracije nivoa smanjenja pritiska koje je neohodno postići konstrukcionim rešenjem čizme može se navesti da sila pritiska kome je izložena čizma prilikom eksplozije nagazne protivpešadijske mine koja sadrži od 30 gr do 100 g TNT iznosi približno 3000 do 8000 Bara. Ispitivanja vršena u tehničkom opitnom centru vojske Srbije čizmom model Ahil pokazala su da je nivo kojem je direktno izložen petni deo stopala pri eksploziji protivpešadijske nagazne mine koja sadrži 35 grama TNT iznosi 145 bara.

The ACHILLES M98A1 model is representing a newest version of combat proven M98 basic model.

The M98A1 model features improved foot comfortability and provides for higher soldier's mobility. Boot development has been finished; the boot has been completely tested under most difficult testing conditions and has been officially accepted and verified by the Serbian Armed forces Test Center.

The M98 basic model entered into serial production for the Serbian Armed Forces in 1998. It has also been exported to some units of the UN peacekeeping forces. This basic model has been combat proven in many cases of soldiers' direct contact with anti-personnel contact mines, manufactured by former Yugoslavia, with designation PMA-3, containing 35g of RDX (equivalent to 46.6g TNT) in various impact conditions, leaving no serious foot injuries.

According to the exact requirements for the design of infantry boots with antipersonnel contact mine protection based on the medical research in some of the customers' armed forces, the maximum pressure that the foot is directly exposed to during the contact/explosion of the anti-personnel contact mine, without suffering serious injuries, is 200 Bar, with a tolerance of 10%, meaning that the maximum pressure allowed (according to the customers' requirements or research results) can reach 220 Bar. In order to illustrate the reduction of pressure which has to be achieved with the boot design, one should know that during the explosion of an anti-personnel contact mine with 30g to 100g TNT, the boot is exposed to the pressure of approximately 3000 to 8000 Bar. The tests of the Achilles boot, conducted in the Technical Test Center of the Serbian Armed forces, have proven that the pressure to which the heel is directly exposed at the time of explosion of the anti-personnel contact mine with 35g of TNT is 145 bar.

TEHNIČKE MOGUĆNOSTI RAZVOJA I PROIZVODNJE OPTOMEHANIČKIH NIŠANSKIH I OSMATRAČKIH SPRAVA U SRBIJI

Piše
Boško ŠIPOVAC

OBRAZLOŽENJE POTREBA

Optomehanički uređaji, OMU (nišanske i osmatračke sprave), omogućavaju da vidimo objekat u okviru svojih fizioloških granica (ono što daje zdravo ljudsko oko), a Optoelektronski uređaji, OEU i van ovih granica. U elektromagnetnom spektru OMU "rade" od 390-770 nm (vidljivo zračenje za ljudsko oko), a OEU od 770-14.000 nm (od bliskog, kratkotalasnog do dugotalasnog IC zračenja).

TECHNICAL CAPABILITIES FOR DEVELOPMENT AND PRODUCTION OF OPTOMECHANICAL SIGHTING AND OBSERVATION DEVICES IN SERBIA

By
Boško ŠIPOVAC

WHY ARE THESE DEVICES NEEDED?

Optomechanical devices (OM – sighting and observation devices) enable us to see an object within our physiological limitations (as far as a healthy human eye allows), while optoelectronic units (OE) go beyond this ability. In the electromagnetic spectrum, OM devices "operate" within 390-770 nm (visible light for the human eye), while OE device within 770-14.000 nm (from near, short-wave to long-wave IR

Uprošteno rečeno OMU koristimo u dnevnim uslovima i u uslovima smanjene vidljivosti kada je neophodno da končanica uređaja bude veštački osvetljena. U uslovima smanjene vidljivosti, kada nivo osvetljaja okoline padne ispod 10 lux-a (rana zora ili večernji sumrak), kroz OMU je moguće videti iole osvetljen cilj za oko vidljivom svetlošću, ali je nemoguće nišaniti jer končanica postaje nevidljiva. Pored ovoga OMU imaju ograničenje koje se naziva meteorološka vidljivost (magla, kiša sneg, oblaci peska i prašine i sl.), a koja je funkcija koeficijenta slabljenja za vidljivo zračenje. Na primer pri umerenoj magli ili kada pada gust sneg (nivo vidljivosti „2") koeficijent slabljenja je 7 km-1, a meteorološka vidljivost 350 m.

OEU: pasivne sprave sa pojačivačima svetlosti, TV kamere visoke osetljivosti, termovizijske kamere, laserski obeležívači cilja, laserski merači daljine, detektori laserskog zračenja i dr., manje ili više uspešno rešavaju probleme koje stvaraju ograničenja za rad OMU, ali su često i ograničenja za pojedine OEU, a što zavisi od talasne dužine na kojoj „rade". Definitivno, izuzev u raketnoj tehnici, još uvek nije ponuđena tehnologija koja nam omogućuje da „noć zameni dan" u akviziciji cilja.

radiation). To put it simply, this means that OM devices are used in daylight and low visibility conditions when the reticle has to be illuminated with artificial lighting. In low visibility conditions, when environmental light is below 10 lx (early dawn or twilight), OM devices enable us to see a target illuminated enough for the eye, but it is impossible to take aim because the reticle becomes invisible. Besides, OM devices have other constraints called meteorological visibility (fog, rain, snow, dust clouds etc.). For example, in moderate fog or heavy snow (visibility level „2"), attenuation coefficient is 7 km-1, and meteorological visibility 350 m.

OE devices: passive devices with image intensifiers, highly sensitive TV cameras, thermal imagers, laser target designators, laser rangefinders, laser detectors etc., can more or less solve the problems created by the operating restrictions of OM devices. Except for the missile technology, we still do not have the technology which would enable the „night to replace the day" in target aquisition.


YUGOIMPORT-SDPR
Very light and compact
Fire control solution will provide
the operator with target range in-formation and then put
the weapon in adequate bearing by use of illumination point, which
posi-tion has been calculated by the computer
(based on measured range and type of ammunition).
FIRE CONTROL SYSTEM FOR ANTI-MATERIEL RIFLE
LASER RANGEFINDER
WITH BALLSITIC COMPUTER

ZATVARANJE KRUGA

Iz gore navedenog razloga, a i zbog cene koštanja OEU, potreba za OMU je još uvek velika te i naša preduzeća sve više ulaze u njihov razvoj i proizvodnju sa tendencijom ka OEU.

Neophodno je naglasiti da proizvodnje OMU u Srbiji nije bilo u periodu od 1949. do 1992. god. Preduzeće precizne mehanike i optike „ZRAK" osnovano 16.11.1948. god. u Beogradu (Kneževac) preseljeno je 1949. god. u Sarajevo, a nastalo je od optičkih radionica Vojnotehničkog Zavoda Kragujevac i Teleoptika Zemun.

Naša preduzeća koja proizvode pešadijska oružja i artiljerijska oruđa veoma teško nalaze na svetskom tržištu odgovarajuće verifikovane OMU za svoja sredstva. Problemi su u balistici (končanica), vezi OMU sa sredstvom i ergonomiji, a koji se uvek rešavaju u razvojnoj fazi uz učešće proizvođača OMU. Iz ovog razloga, razloga cene koštanja, komplikovane procedure uvoza roba specijalne namene, krug prekinut 1949 godine se mora zatvoriti.

TEHNIČKI PREDUSLOVI ZA RAZVOJ I PROIZVODNJU OMU

Osnovni tehnički uslov za uspešan razvoj, osvajanje ili reosvajanje i serijsku proizvodnju je :

- obrazovan inženjerski i majstorski kadar iz oblasti tehničke optike, dizajna i tehnologije optičkih slojeva, konstrukcije OMU i kontrolno merne opreme, montaže itd.

Svaki razvoj se verifikuje kroz prototip, a male prototipske partije od 3 do 10 komada su veoma skupe, a i veoma je teško obezbediti delove od kooperanata, posebno iz inostranstva (sočiva, prizme, končanice).

COMPLETING THE CIRCLE

For the reason stated above, and due to the price of OE devices, OM devices are still largely needed, and our companies are more readily starting their development and production, with the intention of starting the development of OE devices.

It should be emphasized that OM devices were not produced in Serbia from 1949 to 1992. The company dealing with precision mechanics and optics, „ZRAK", founded on 16 November 1948 in Belgrade (Kneževac) was moved to Sarajevo in 1949. It grew from the optical workshops of the Military Technical Depot in Kragujevac and Teleoptik in Zemun.

Our companies producing infantry and artillery weapons cannot easily find verified OM devices for their ordnance on the world market. The main problems are ballistics (reticles), connection between the OM device and the weapon and ergonomy, which are invariably solved in the stage of development together with the OM device producer. For this reason, as well as the price and complicated import procedure for the special purpose goods, the circle interrupted in 1949 has to be completed again.

TECNICAL PREREQUISITES FOR DEVELOPMENT AND PRODUCTION OF OM DEVICES

The main technical prerequisite for a successful development, mastering and re-mastering of production, and for serial production is:

Kućišta OMU se rade tehnologijama livenja: precizni liv raznih legura i liv pod pritiskom aluminijskih i magnezijumskih legura. Livački alati se rade tek za serijsku proizvodnju i veoma su skupi, a izrada prototipskih komada „iz punog" zahteva velika vremena izrade.

Ovi tehnički preduslovi se uglavnom mogu obezbediti ukoliko se stvore finansijske predpostavke.

Izvozni ugovori Jugoimport-SDPR-a su potakli neka preduzeća da iskoriste postojeće resurse, kadrovske i proizvodne i uspešno reosvoje nekoliko veoma zahtevnih OMU.

Tako je preduzeće „TELEOPTIK-ŽIROSKOPI" Zemun, uspešno osvojilo proizvodnju:

- nišanskih sprava za minobacače 60, 81, 82, 120 mm,
- artiljerijskih sistema za merenje i osmatranje, sa magnetnom busolom i azimutskim dodatkom za utvrđivanje geografskog severa (za period 2000 do 2050 god.),
- optičkih nišana za snajperske puške i automatska oružja.

Prateći ovu proizvodnju, Preduzeće za proizvodnju optičkih komponenti „ME_OPTA" iz Beograda (Rakovica) je osvojilo veći broj sočiva i prizmi, a što je veoma značajno i preciznih libela bez kojih se ne može ni zamisliti nišanjenje i gađanje u artiljeriji.

- well educated engineers and skilled workers in the field of technical optics, design and technology of optical layers, design of OM devices and measuring equipment, mounting etc.

Development has to be verified by making a prototype, but small prototype lots of 3- 10 pieces are very expensive, while provision of parts (lenses, prisms, reticles) from subcontractors, especially from the ones abroad, is very hard.

The casings of OM devices are made by casting: precision casting of various alloys and pressure casting of aluminum and magnesium alloys. Casting molds are made only for serial production and are very expensive, and manufacture of actual-size prototypes demands time.

In most cases, these technical prerequisites can be met if financial support is secured.

Export contracts signed by Yugoimport-SDPR have encouraged some of the companies to use the existing resources, both personnel- and production-wise, and to re-master successfully a few very demanding OM devices.

„TELEOPTIK-ZIROSKOPI" from Zemun mastered successfully the production of:

- sighting devices for 60, 81, 82, 120 mm mortars
- artillery measurement and observation systems, with the magnetic compass and azimuth device for north finding (for the period of 2000 to 2050),
- optical sights for sniper rifles and automatic weapons.

Following up this production, a company for production of optical components - „ME_OPTA" from Belgrade (Rakovica) – has mastered the production of a number of lenses and prisms, and more importantly, of precise spirit levels essential for aiming and firing with artillery weapons.

Our companies in this field are:

- „SENZOR-INFIZ" from Zemun: producing engraved reticles and some optical layers,
- „EI OPEK" from Niš – producing non-engraved reticles,
- „GROSSOPTIC" from Umka, Belgrade: producing multi-layered, anti-reflexive layers.

Conditions for indigenous producers of observation and sighting devices are thus being

Od ranije naša preduzeća iz ove oblasti već proizvode:

- „SENZOR-INFIZ" Zemun, gravirane končanice i neke optičke slojeve,
- „EI OPEK" Niš, negravirane končanice,
- „GROSSOPTIC" Umka, Beograd, višeslojne antirefleksne slojeve.

Ovako se postepeno stvaraju uslovi da proizvođači oružja i oruđa imaju domaće proizvođače osmatračkih i nišanskih sprava, a što je još važnije i brz razvoj savremenih OMU.

Krilatica „niko se još nije odrekao „dnevne sprave" u sastavu svog naoružanja" opravdava nastojanje da se proizvode i ova samo na prvi pogled stara sredstva (ali modernog dizajna).

OEU su moderniji ali se bez OMU ne može.

NIŠANSKA SPRAVA ZA MINOBACAČ 120 mm NSB-4B

Tehničke karakteristike:

- Uvećanje	1,8 x
- Vidno polje	8^o
- Ulazna apertura	12,7 mm
- Prečnik pupile	5,5 mm
- Udaljenje pupile	25 mm
- Mogućnost viziranja od	-13^o do $+25^o$
- Tačnost zauzimanja horizontalnih uglova	0-01,5
- Tačnost zauzimanja vertikalnih uglova	0-02
- Najmanja podela ploča pravca i visine	0-01
- Najmanja podela doboša pravca i visine	1-00
- Podele	60-00 ili 64-00
- Osetljivost libela	5-7'
- Masa sprave	0,8 kg
- Osvetljenje	baterijsko ili beta izvorom svetlosti

PERISKOPSKA ARTILJERIJSKA BUSOLA PAB-2AT

Tehničke karakteristike busole:

- Uvećanje	8x
- Vidno polje	0-83
- Ulazna apertura	22 mm
- Prečnik pupile	2,8 mm
- Udaljenost pupile	12,7 mm
- Meri horizontalne uglove	od 0 do 360^o
- Meri verikalne uglove	od -18^o do $+18^o$
- Meri daljine	50 do 400 m
- Vrednost podela na pločama	0-01
- Vrednost podela na dobošima	1-00
- Podela	60-00
- Masa	2,5 kg

Tehničke karakteristike periskope:

- Uvećanje	1x
- Vidno polje	5^o
- Periskopičnost	350 mm
- Masa	0,6 kg

Tehničke karakteristike azimutskog dodatka:

- Uvećanje	4x
- Vidno polje	1-55,5
- Prečnik pupile	4 mm
- Masa	0,75 kg
- Osvetljenje	baterijsko ili beta izvor svetlosti.

created, which provides the weapon producers with indigenously made observation and sighting devices, and more importantly these conditions have paved the way for fast development of state-of-the-art optomechanical devices.

The catchphrase „no army has given up the day sight" justifies the efforts for production of these seemingly outdated devices (with state-of-the-art design).

OE devices are more modern, but OM devices are indispensible

SIGHTING DEVICE FOR 120 mm MORTAR NSB-4B

Technical data:

- Magnification	1.8 x
- Field of view	8^o
- Entry aperture	12.7 mm
- Pupil diameter	5.5 mm
- Pupil distance	25 mm
- Line of sight	-13^o to $+25^o$
- Horizontal laying accuracy	0-01.5
- Vertical laying accuracy	0-02
- Minimum graduation of elevation/direction screw	0-01
- Minimum graduation of elevation/direction drum	1-00
- Graduation	60-00 or 64-00
- spirit level sensitivity	5-7'
- Weight	0.8 kg
- Illumination	battery or source of beta rays

PERISCOPIC ARTILLERY AIMING CIRCLE PAB-2AT

Technical data for the aiming circle:

- magnification	8x
- Field of view	0-83
- Entry aperture	22 mm
- Pupil diameter	2.8 mm
- Pupil distance	12.7 mm
- Measures horizontal angles	0 to 360^o
- Measures vertical angles	-18^o to $+18^o$
- Measures range	50 to 400 m
- Graduation value on the screws	0-01
- Graduation value on the drums	1-00
- Graduation	60-00
- Weight	2,5 kg

Technical data for the periscope:

- Magnification	1x
- Field of view	5^o
- Periscopicity	350 mm
- Weight	0.6 kg

Technical data for the azimuth device:

- Magnification	4x
- Field of view	1-55,5
- Pupil diameter	4 mm
- Weight	0,75 kg
- Illumination	battery or source of beta rays

PRENOSNI IZVIĐAČKI RADARI U RAZVOJNOM PROGRAMU JUGOIMPORT-SDPR

Piše
Ćedomir Gacović

Savremeni sisitemi za osmatranje i kontrolu određene teritorije, odnosno zaštitu objekata i zona od posebnog značaja, koji su namenjeni kako mirnodopskoj primeni, tako i primeni u ratnim dejstvima (uslovima), dobijaju posebno na značaju eskalacijom terorističkih i pobunjeničkih dejstava. Sistemi su po svome konceptu kompleksni i bazirani na integraciji više tipova senzora u kompleksni senzorski sistem. Radari za otkrivanje i praćenje žive sile, vozila i niskoletećih objekata jesu praktično nezamenljivi sastavni elementi ovakvog sistema.*

Tehnička rešenja ovih radara, iz razloga veće fleksibilnosti upotrebe, najčešće se razvijaju u vidu prenosnih sistema, koji se mogu rastaviti.

U br.25 našeg časopisa objavljen je članak Slobodana Jolkića pod naslovom "Sistem zaštite granica, teritorije i objekata od posebnog značaja", u kome je kao jedan od senzora pomenut prenosni izviđački radar PR-15. Predmet ovog članka je nešto detaljniji opis ovog radara, u koju grupu spada i na kojim teorijskim osnovama temelji.

Osim primene u visokointegrisanim kompleksnim sistemima za zaštitu teritorije, prenosni zviđački radari mogu se primenjivati samostalno ili uvezivanjem u bateriju, kada se koriste za različite taktičke zadatke smatranja određene teritorije, od strane različitih taktičkih jedinica.

MOBILE SURVEILLANCE RADARS IN YUGOIMPORT-SDPR DEVELOPMENT PROGRAM

By
Ćedomir Gacović

Current systems for observation and control of designated territory i.e. for protection of priority buildings and zones, designed for peacetime as well as for wartime applications (conditions), are increasingly important as terrorist and rebel activities escalate. By their concept, these systems are complex since they involve integration of multiple types of sensors within a complex sensor system. Radars able to detect and track manpower, vehicles and low-flying aircraft are indispensable composite elements of these systems.

Technical solutions of these radars, in order to achieve increased flexibility of deployment, are predominantly developed as mobile, dismantable units

Vol. 25 of our Magazine contained an article by Slobodan Jolkić entitled „System of protection of frontiers, territories and priority buildings" which, among others, mentions the mobile surveillance radar PR-15. Subject matter of this article is somewhat more detailed description of that radar, the category to which it belongs and theoretical concepts of its design.

Except for application in highly integrated territorial protection systems, mobile surveillance radars may be employed autonomously or linked into batteries when they are used for different tactical missions in observing a designated territory by diverse tactical units.

Prenosni izviđački radari se upotrebljavaju u na različitim vrstama terena, sa postavljanjem radarske antene na otvorenom prostoru, a sa postavljanjem operatora u prirodnom zaklonu, objektu ili rovu, sa motornog vozila iz mesta ili u pokretu, sa morske obale i to u svim vremens kim uslovima. Namenjeni su za osmatranje, otkrivanje, merenje koordinata i identifikaciju pokretnih ciljeva ispred prednjeg kraja i u pozadini protivnika; za osmatranje morskih i rečnih prolaza; za zaštitu važnih objekata (aerodroma, vatrenih položaja oruđa, skladišta , itd.); za zaštitu državnih granica itd.

Od početka primene radara za izviđanje zemljišta do danas proizvedeno je i nalazi se u upotrebi veliki broj tipova koji se međusobno razlikuju prema masi, načinu nošenja ili transporta, dometu, prema zadatku koji obavljaju ili prema nivou jedinica kojima se dodeljuju.

Prema zadatku koji obavljaju dele se na:

- Radare za izviđanje ciljeva na zemljištu radi upozorenja; to su obično lagani, prenosni radari malog dometa, sa manje tačnim koordinatama;
- Radare za izviđanje ciljeva na zemljištu sa tačnim određivanjem koordinata; služe za dobijanje elemenata za otvaranje i korekciju artiljerijske vatre, pa se nazivaju artiljerijskim radarima;
- Radare za određivanje vatrenih položaja minobacača ili haubica.

Prema ostalim performansama (masa, način nošenja, domet), radari za izviđanje ciljeva na zemljištu dele se na:

- Male radare za izviđanje zemljišta, dometa do 10 km; nosi ih i opslužuje jedan poslužilac, a obično se koriste na nivou voda ili čete;
- Srednje radare za izviđanje zemljišta, dometa do 25 km; prevozni su i opslužuje ih jedan ili više poslužilaca, a primenjuju se na nivou bataljona i brigada; određivanje koordinata je dovoljno tačno za otvaranje artiljerijske vatre, i
- Velike radare za izviđanje zemljišta sa dometom preko 25 km

Sa razvojem tehnologije broj poslužilaca se smanjuje, smanjuje se težina i pojednostavljuje rad. Već danas je ovakva podela prevaziđena zbog toga što se proizvode radari koji po dimenzijama i masama spadaju u male radare a po dometu u srednje ili velike a opslužuje ih samo jedan poslužilac.

Mobile surveillance radars are deployed on various kinds of terrain, with antenna masts mounted in open area and radar operators placed in natural shelters, buildings or trenches, in stationary or moving vehicles, on sea coast and in all weather conditions. They are intended for surveillance, detection, coordinates' measuring and identification of moving targets situated ahead of forward positions and in the rear of the adversary, for observation of sea and river routes; for protection of priority installations (airfields, artillery firing positions, storage depots etc.); for protection of state borders etc.

Since the beginning of application of terrain surveillance radars to date, large number of types have been produced and are in service, mutually differing in their mass, manner of carrying or transporting, operating range, missions they are able to serve and level of units to which they are allocated.

According to the missions they have to perform, they are divided in:

Ground target surveillance radars for warning application; generally they include light-weight mobile radars of short range with not so accurate coordinates;

Ground target surveillance radars able to measure exact target coordinates and serve to provide firing data and artillery fire adjustment data, they are called artillery radars;

Radars able to locate fire positions of mortars or howitzers.

According to other specifications (mass, manner of carrying, range) ground target surveillance radars are divided in:

Small radars for terrain surveillance, with the range of up to 10 km, they are carried and operated by single operator and generally used by platoon or company level units;

Medium-sized radars for terrain surveillance, with the range of up to 25 km; of mobile type and served by one or a number of operators, employed at battalion or brigade levels; their coordinate fixing is sufficiently accurate for opening of artillery fire; and

Large radars for terrain surveillance with ranges exceeding 25 km.

As technologies advance, so the number of operators decreases, equipment mass becomes lower and operation is simplified. Accordingly, the above stated classification is made obsolete being that currently produced radars belong to small radars

YUGOIMPORT-SDPR

STABILIZED PANORAMIC SURVEILLANCE AND TARGET ACQUISITION OPTRONIC STATION

Main missions:

- Panoramic, stabilized battlefield surveillance and observation, both day and night and under adverse weather conditions
- Target acquisition and engagement
- Automatic target tracking
- Target coordinates measuring including range finding and data transmision to the higher command level

Adaptability for integration with various platforms:

- main battle tanks
- recconaissance vehicles
- light wheeled vehicles for border and perimeter control
- shipborne platforms

Main sensors:

- Laser Rangefinder
- Double field of view color CCD TV camera
- Thermal Imaging Camera
- Mechanism for raising & lowering, in order to achieve better observation of battlefield conditions

Mogu da rade i u pokretu, pa je njihovu lokaciju veoma teško odrediti. Zbog pokreta, stalno se menjaju pokrivena i nepokrivena područja osmatranja. Stoga je otežano ne samo određivanje njihove lokacije, već i primena odgovarajućih taktičkih i tehničkih protivelektronskih dejstava. Masovno se koriste u savremenim oružanim snagama, prvenstveno u kopnenoj vojsci.

Savremena borbena dejstva, karakterisana sve većom gustinom ciljeva po dubini i velikom pokretljivošću, uvećala su zonu odgovornosti pojedinih nivoa komandovanja. To od radara zahteva veći domet. Reljef zemljišta ograničava domet, pogotovo na brdovitom ili pošumljenom zemljištu.

Princip rada

Prenosni izviđački radar PR-15 temelji na doplerovom efektu. Doplerov efekat je pojava promene frekvencije talasnog procesa pri međusobnom relativnom kretanju izvora talasnog procesa i prijemnika. Kada se izvor talasa kreće prema prijemniku, detektuje se talasni proces veće frekvencije od one koju izvor stvarno emituje. U suprotnom slučaju, kada se izvor udaljava, detektuje se signal niže frekvencije.

Radar je potpuno koherentan. Pod potpunom koherencijom se podrazumeva da su fazni odnosi svih signala u električnim kolima uređaja, bez obzira na njihovu frekvenciju ili talasni oblik, međusobno čvrsto vezani i da se održavaju konstantnim za sve vreme rada radara. Signali čija frekvencija nije direktno izvedena iz frekvencije osnovnog oscilatora, deljenjem ili umnožavanjem njihove frekvencije, dovode se u koherenciju sa ostalim signalima primenom faznoregulacionih petlji. Međusobno čvrsti fazni odnosi dvaju koherentnih oscilacija odnose se kako na osnovne ,tako i na više harmonike, a takođe i na komponente faznih šumova sadržanih u talasnom obliku oscilacija.

Razvoj radarskih sistema za izviđanje ciljeva na zemljištu snažno je potaknut razvojem novih mikrotalasnih i informacionih tehnologija (poluprovodnički pojačavači, štampane antene, mikroprocesori opšte namene, operativni sistemi za rad u realnom vremenu, digitalni procesori signala itd.). Značajan je uticaj imala i primena sofisticiranih algoritama za digitalnu obradu signala koji su prvobitno razvijani za potrebe modernizacije radara za izviđanje ciljeva u vazdušnom prostoru kao i avionskih radara.

Nekada su radari iz ove grupe bili usko specijalizovani za pojedine zadatke (izviđanje kretanja ljudi, određivanje koordinata ciljeva na zemljištu za potrebe artiljerije, radari za otkrivanje položaja minobacača i sl.).

Današnji radari za izviđanje ciljeva na zemljištu su multifunkcionalni radari koji u sebi integrišu funkcije otkrivanja pokretnih objekata različitih po tipu i po brzini kretanja, navođenje i korekturu artiljerijske vatre i otkrivanje niskoletećih ciljeva (helikoptera i bespilotnih letelica).

Otkrivanje protivničkih snaga i njihovih pokreta na bojištu je posebno težak tehnički problem. Tu se ne radi, kao u slučaju osmatranja vazdušnog prostora, o uvek vidljivom cilju na jednoličnoj pozadini, što tehnički znači sa velikim kontrastima, već se radi o ciljevima koji se malo ili skoro uopšte ne razlikuju od pozadine pune stalnih odraza. Ovi radari detektuju ciljeve s jakim „zemaljskim klaterom“ u pozadini, jer je zemljište obasjano glavnim snopom radarske antene, za razliku od radara according to their dimensions and mass, however their ranges equal medium-sized or large radars and they are operated by a single operator.

They are able to function while on the move, thus their location is very difficult to detect. Being on the move, their exposed and masked observation zones constantly change. For that reason, location of these radars and taking of appropriate tactical and technical electronic countermeasures are made difficult. These radars are massively used primarily by modern land armies.

Current combat operations, characterized by ever increasing in depth target density and high target mobility have expanded the zones of responsibilities for specific commanding levels. This places the requirement for longer radar ranges. On the other hand, terrain topography limits the range, especially on hilly or wooded country.

Operating principle

Mobile surveillance radar PR-15 is based on Doppler effect. Doppler effect is manifested by change of frequency of the wave process during mutual relative movement of the source of wave process and receiver. When wave source moves toward receiver, wave process of higher frequency than the frequency actually emitted by the source is detected. In opposite case, when the source moves away, lower frequency signal is detected.

This is fully coherent radar. Full coherence means that phase relationship of all signals in unit's electrical circuits, irrespective of their frequency or waveform, are mutually firmly linked together and kept constant throughout radar's operation. Signals,

namenjenih za osmatranje vazdušnog prostora, koji zemljište obasjavaju donjim bočnim snopom. Sem toga, ti ciljevi se najčešće kreću po neravnom terenu, pa se, zbog pravolinijskog prostiranja elektromagnetskih talasa, naizmenično pojavljuju i nestaju. Zbog toga je selekcija pokretnih ciljeva veoma značajna u ovim radarima, koji su u bliskoj prošlosti često realizovani kao impulsno-doplerovi radari.

Jedan od osnovnih razloga za to je jednostavna konstrukcija takvih radara a posebno, jednostavna realizacija bloka za obradu signala. Najsloženije radnje u ovom domenu, detekciju i klasifikaciju ciljeva, najčešće je obavljao čovek, tako da nije bilo potrebe za korišćenjem digitalnih procesora koji su tada bili relativno velikih dimenzija i vrlo zahtevni kad su u pitanju mikroklimatski uslovi. Ovo je znatno pojednostavilo projektovanje i proizvodnju radara, posebno kada se ima u vidu činjenica da se u malim radarima moralo posebno voditi računa o uštedi prostora, te da se nisu mogli stvoriti povoljni mikroklimatski uslovi kao u kabinama velikih radara.

Nedostatak ovakvog načina obrade signala je pre svega dug vremenski interval dobijanja informacija o cilju zbog inertnosti operatora. Ovome treba dodati nemogućnost stvaranja sintetičke slike osmatranog sektora i otežano slanja dobijene informacije dalje u sistem. Ovi nedostaci nisu bili značajni sve dok su „mali radari“ bili usko specijalizovani i više služili kao dopuna drugim senzorima.

Razvojem novih mikrotalasnih i informacionih tehnologija stvoreni su uslovi da se algoritmi za obradu radarskih signala, koji se neprekidno razvijaju i koriste u osmatračkim radarima PVD, implementiraju i u „malim radarima“. To znači da savremeni radarski sistemi za izviđanje ciljeva na zemljištu rade na istim principima i imaju slične performanse kao i klasični, „veliki radari“.

Iako se savremeni mali radari ređe projektuju kao impulsno-doplerovi, jednostavna konstrukcija novih i jeftina modernizacija postojećih radara, čine ih atraktivnim i danas.

Osnovna odlika impulsno-doplerovih radara je visoka vrednost frekvencije ponavljanja impulsa (Pulse Repetition Frequency, PRF), pri čemu je trajanje impulsa jednako trajanju pauze radarskog signala. To znači da su vrlo slični radarima s kontinualnim zračenjem (Continuous Wave, CW), kod kojih je obavezna upotreba dve dovoljno izolovane antene i koji se koriste ukoliko je bitan parametar brzina cilja, a ne i daljina, jer se njima jednostavno mogu meriti Doplerove frekvencije.

the frequency of which is not derived from the frequency of base oscillator (by frequency division or multiplication) are brought to coherence with other signals by means of phase regulating loops. Mutually firm phase relationship of two coherent oscillations pertains to base frequency as well as to its higher harmonics, but also to phase noise components contained within the oscillation waveform.

Development of ground target surveillance radars is strongly stimulated by ongoing development of new microwave and information technologies (semiconductor-based amplifiers, printed antennas, general-purpose processors, real-time operating systems, digital signals processors, etc.). Significant effect, too, had the application of sophisticated algorithms for digital signal processing, initially developed for modernization of aerial target surveillance radars and for aircraft radars.

Originally, radars of this category were strictly specialized for allotted missions (surveillance of human movements, fixing of land target coordinates for the needs of artillery, mortar position detecting radars, etc.)

Present-day ground target surveillance radars are multifunctional radars that integrate detection of moving land targets according to their types and speed of motion, directing and adjustment of artillery fire and detection of low-altitude aerial targets (helicopters and unmanned air vehicles).

Detection of hostile forces and their movements in the battlefield represent particularly difficult technical problem. It is not the case, like in surveillance of the airspace, of continuously visible target superimposed against uniform background, technically meaning strong contrast, but of targets which barely stand out, or not at all, against background full of ground clutter. These radars are able to detect targets against strong ground clutter in the background as the terrain is illuminated by main beam of radar antenna, as opposed to air surveillance radars that illuminate the ground with their lower side lobes only. Besides, ground targets most often move over uneven terrain, surreptitiously appearing and disappearing because of linear propagation of electromagnetic waves. Therefore the great importance of selection of moving targets by these radars which, until recently, were usually designed as pulse-Doppler radars.

One of main reasons for this is simple construction of these radars and, in particular, simple design of signal processing module. More complex operations in this domain, namely target detection and classification, were usually performed by human operator and there was no need for digital processors, which, at the time were bulky and very demanding in respect of microclimatic conditions. Such circumstances have greatly simplified both the design and production or these radars, especially bearing in mind the fact space saving was an imperative for compact radars that could not provide favorable microclimatic environment available in full size radar shelters.

Shortcoming of that manner of signal processing is in the first place long time period needed to acquire information due to inertness of operator. Additionally, there was no possibility to create synthetic image of observed sector and it was difficult to send the acquired information within the system. These disadvantages were not significant as long as “small radars” served only for specialized purposes, complementing other sensors.

Development of microwave and information technologies, on the other hand, created the conditions that radar signal processing algorithms, constantly developed and used in air defense radars, could be applied in “small radars” as well. Eventually,

Prednost impulsno-doplerovih radara je činjenica da se koristi samo jedna antena. Sličnost sa CW radarima rezultuje visokim performansama u selekciji pokretnih ciljeva i jednoznačnim merenjem brzine. Impulsno-doplerovi radari imaju osobine i impulsnih radara, pa je njima moguće meriti i rastojanje do cilja.

Rade u dva režima. Prvi režim je pretraživanje, kada je trajanje impulsa jednako trajanju pauze radarskog signala i do izražaja dolaze osobine CW radara. Drugi režim je daljinomer, kada se koriste osobine impulsnih radara. U prvom režimu se detektuju pokretni ciljevi, a ne mogu se izmeriti daljine do ciljeva. Pri tom se zadati sektor osmatranja neprekidno skanira glavnim snopom antene.

Prijemnik je isključen za vreme predaje, a uključen tokom čitavog vremena trajanja pauze. U prijemnom kanalu, radarski signal sa antene se iz visokofrekventnog opsega translira naniže, u međufrekventni opseg. Faza međufrekventnog signala sadrži informaciju o brzini potencijalnog cilja. Ukoliko u regionu obasjanom glavnim snopom antene postoji pokretan cilj, početna faza impulsa iz međufrekventnog signala će se menjati od impulsa do impulsa, srazmerno radijalnoj brzini cilja.

Međufrekventni signal se dalje translira u osnovni opseg, gde se promena početne faze pretvara u promenu amplitude signala od impulsa do impulsa. Nakon prolaska kroz niskopropusni filter, dobija se kontinualan signal, koji se u literaturi najčešće naziva audio-doplerov signal, čija je trenutna frekvencija srazmerna trenutnoj radijalnoj brzini cilja. Sa stanovišta dalje obrade signala, u ovom režimu rada nema razlike između CW radara i impulsno-doplerovog radara.

Nakon detekcije pokretnog cilja u režimu pretraživanje prelazi se u režim daljinomer kada se meri daljina do registrovanog cilja. Pri tom cilj mora sve vreme biti osvetljen glavnim snopom antene.

Merenje daljine se odvija kroz sledeće faze:

- Skraćuje se trajanje predajnog impulsa, perioda ponavljanja impulsa se ne menja, što znači da se trajanje pauze produžava.
- Prijemnik se uključuje za vreme trajanja pauze, ali u kraćem intervalu, jednakom trajanju impulsa.
- U ovom stanju predajnik i prijemnik ostaju neko vreme dok operator (ili blok za obradu signala) na osnovu audio signala ne donese odluku da li je cilj prisutan ili nije.

current ground target surveillance radars operate on same principles and show similar performance as conventional “full size” radars.

Although current “small radars” are seldom designed as pulse-Doppler radars, simple construction of new units and cheap modernization of existing radars still make this type an attractive proposition.

Main feature of pulse-Doppler radars is their high pulse repetition frequency (PRF) where duration of radar signal equals duration of the pause between signals. This means that these radars are very similar to continuous wave (CW) radars that mandatorily require two sufficiently isolated antennas, which are used when target velocity, not target range, is the dominant parameter since Doppler frequencies can be easily measured with them.

The advantage of pulse-Doppler radars is in the fact that only one antenna is needed. Similarity with CW radars results in high performance selection of moving targets and singular velocity measuring. Pulse-Doppler radars also feature the properties of pulse radars, thus they are also able to measure target range.

They operate in two modes. First mode is search, during which duration of a pulse equals duration of emitting pause, when properties of CW radars come to the fore. Second mode is ranging, when properties of pulse radars are put to use. In the first mode moving targets are detected, but their ranges cannot be measured. Designated surveillance sector is continually scanned by antenna main beam.

Receiver is switched-off during transmission and it is engaged during entire pause period. In the receiving channel, radar signals from the antenna are transformed from high frequency range to lower, intermediate frequency. The phase of intermediate frequency signal contains information of potential target’s velocity. If within the zone illuminated by antenna main beam a moving target is detected, initial phase of intermediate frequency pulse will change with each pulse in proportion with radial velocity of detected target.

Intermediate frequency signal is further converted to base frequency range where change of initial phase is transformed to signal amplitude changes from pulse to pulse. After passing through low pass filter, continuous signal is created, in literature commonly named audio-Doppler signal, the frequency of which at that moment is proportionate to current radial velocity of target. With regard to further signal processing, in this operating mode there is no difference between CW and pulse-Doppler radar.

After detection of a moving target in search mode, mode is changed to ranging to measure the distance of detected target. Throughout this operation, target has to be continuously illuminated by antenna main beam.

Ranging is carried out through the following phases:

Duration of transmitting pulses is shortened while pulse repetition period remains unchanged, effectively duration of the pauses is extended.

Receiver is switched on during the pause time, but for shorter intervals, equal to pulse duration periods.

This operating phase of transmitter and receiver will remain for a while, until the operator (or signal processing module) decides whether target is present or not.

If target is not present, operator switches on the receiver using another interval. The procedure is repeated until the entire range of singular velocities has been reset.

- Ukoliko cilj nije prisutan, operator uključuje prijemnik u nekom drugom intervalu. Postupak se ponavlja dok se ne prebriše čitav opseg jednoznačnih daljina.

Kad se na izlazu radara pojavi audio-doplerov signal, kao posledica prisustva pokretnog cilja u posmatranom delu prostora, operator fino reguliše položaj prijemnog prozora dok signal ne postane potpuno jasan. Tada očitava daljinu. Na ovaj način može se detektovati i veći broj ciljeva, dovoljno razmaknutih po daljini, na istom azimutu, sa nepromenjenim položajem antene.

Merenje daljine cilja uzrokuje smanjenje brzine ili čak zaustavljanje skeniranja, jer je potrebno da protekne dovoljno vremena kako bi se dobio jasan audio-doplerov signal od cilja.

Kod klasičnih osmatračkih radara ovo vreme iznosi nekoliko ms tako da ne postoji problem dugog trajanja detekcije i merenja daljine. Ukoliko je ono predugo (usled dugog vremena merenja daljine i klasifikacije cilja, a u sektoru se nalazi više ciljeva), korisnik je prinuđen da smanji sektor osmatranja. Za upotrebu radara na neravnom terenu, gde se ciljevi često pojavljuju i gube, posebno je važno skratiti vreme trajanja detekcije i klasifikacije ciljeva. Ukoliko se radar koristi na ravničarskom terenu, ovo vreme je manje kritična veličina.

Prema tome, prilikom projektovanja radara morali su se prihvatiti određeni kompromisi. Sa stanovišta dužine trajanja detekcije i klasifikacije ciljeva, dobra okolnost za male radare je ta što se ciljevi na zemljištu znatno sporije kreću u odnosu na ciljeve u vazduhu. Međutim, mala radijalna brzina znači i manju frekvenciju audio-doplerovog signala. Na taj način on postaje sličniji klateru, pa ga je teže detektovati.

U impulsno-doplerovim radarima uvek se obrađuje signal iz jedne rezolucione ćelije i zbog toga je blok za obradu signala znatno jednostavniji nego kod klasičnih osmatračkih radara, gde se vrši paralelna obrada eho signala iz svih rezolucionih ćelija na osi daljine. Broj impulsa reflektovanih od cilja kod osmatračkih radara je relativno mali, reda nekoliko desetina impulsa, pa se detekcija uglavnom obavlja u vremenskom domenu (video integracija).

U našem impulsno-doplerovom radaru broj reflektovanih impulsa od cilja je vrlo veliki, reda nekoliko hiljada, što omogućuje ne samo detekciju ciljeva već i njihovu kvalitetnu klasifikaciju, jer se obrada signala može obaviti u združenom vremensko-frekvencijskom domenu. Najracionalnije je bilo da se detekcija audio-doplerovog signala obavi u frekvencijskom domenu, pomoću brze furijeove transformacije (FFT), jer pri tipičnim uslovima rada (vreme obasjavanja cilja je manje od 1 sekunde, npr. ako je širina glavnog snopa antene 5°, brzina obrtanja antene 10°/sek, vreme obasjavanja cilja je 0,5 sek) prednosti vremensko-frekvencijske analize ne dolaze do izražaja. Operacija traženja maksimuma u spektrogramu sigurno nije dala optimalno rešenje, jer su dobijeni lošiji rezultati nego primenom FFT, a iz teorije je poznato da se FFT može dobiti iz spektrograma njegovim usrednjavanjem po vremenu. Bolji rezultati se dobijaju ako se na spektrogram primeni neki od algoritama za detekciju linija u slici. Međutim, ti algoritmi su izrazito nelinearni, pa je njihovo izračunavanje znatno složenije. Ovi algoritmi se primenjuju za prepoznavanje oblika u slici u opcijama gde se koristi klasifikacija, odnosno problem višestrukog testiranja hipoteza. Za rešavanje osnovnog problema detekcije sasvim je zadovoljavajuća primena FFT.

U tom slučaju nulta hipoteza bi bila nema cilja, dok bi se alternativna hipoteza podelila na klase i potklase npr. prisutan cilj-pešak-usamljen, prisutan cilj-pešak-grupa, prisutan cilj-vozilo-točkaš itd.

When audio-Doppler signal appears at radar output, indicating the presence of a moving target within the surveyed zone, operator will make fine adjustment of receiving window until the signal becomes completely clear. Target range is then read out. In this manner is possible to detect multiple targets, sufficiently spaced in range but of same azimuth, without changing of antenna position.

Target range measuring causes reduced rate, or even stopping, of scanning since sufficient time has to elapse in order to obtain clear audio-Doppler signal from a target.

In conventional observation radars this time period amounts to several milliseconds, so there are no problems of long detection and ranging. If that period is too long (because of extended time needed to measure range and classify target while there are multiple targets within the sector), the user shall be forced to reduce his observation sector. When radar is used on uneven terrain where targets tend to appear and disappear, shorter period of target detection and classification is of prime importance. If radar is used on level ground, this time period is not so critical.

Therefore, certain compromises must be accepted when designing ground target radars. With respect to duration of target detection and classification period, an advantage in case of small radars is the fact that ground targets move at much lower speed compared to aerial targets. On the other hand, small radial velocity means lower frequency of audio-Doppler signals. These signals therefore become alike to ground clutter and are thus more difficult to detect.

Pulse-Doppler radars always use single resolution cell for signal processing, therefore their signal processing module is much simpler than in conventional surveillance radars which process parallel echo signals from all resolution cells in a range axis. Number of pulses reflected from target in surveillance radars is relatively small, in the order of several dozen pulses; accordingly detection is mostly achieved within the time domain (video integration).

In our pulse-Doppler radar the number of target reflected signals is great, in the order of several thousands, which allows not only detection but also quality classification of the pulses since signal processing can take place in combined time-frequency domain. It would be most rational to perform detection of audio-Doppler signals within the frequency domain, using fast Fourier transformations (FFT) because in typical operating conditions (period of target illumination les than 1 sec. If, for example, the width of antenna main beam is 5o, antenna rotation rate is 10o/sec., duration of target illumination is 0.5 sec.), then the advantages of time-frequency analysis are not manifested. Looking for maximum in a spectrogram certainly will not provide optimum solution and the results obtained are inferior to those obtained by using FFT method; from theory it is known that FFT may be obtained from spectrogram, by its averaging in time. Better results are reached if one of image line detection algorithms is applied. On the other hand, these algorithms are prominently non-linear and their calculating is more difficult. The algorithms are used for recognition of image shapes in options when classification is used, resp. when multiple hypothesis testing is performed. To resolve the basic issue of target detection it is sufficient to apply FFT method. In such case, zero hypothesis is no target, while alternative hypotheses are broken down in classes and sub-classes, for example solitary target infantryman present, group target infantrymen present, wheeled vehicle target present, etc.

Vrlo je važan i sam proces donošenja odluke, za koji je neophodan prag detekcije. On se u radaru PR-15 izračunava u bloku za održavanje konstantnog nivoa lažne uzbune (CFAR). Naime, radarski signal formiran u prijemniku je nužno degradiran prisustvom šuma, namernih smetnji i stalnih odraza, a to direktno utiče na proces donošenja odluke.

Da bi se rad sistema za detekciju radaraskog prijemnika, a samim tim i radarskog sistema u celini, mogao smatrati pouzdanim, neophodno je obezbediti radne uslove pod kojima će verovatnoća pojave lažnog alarma imati specificiranu, konstantnu vrednost tokom rada.

Dakle, umesto rada sa pragom odlučivanja konstantne vrednosti neophodno je primeniti adaptivne algoritme za postavljanje praga odlučivanja: one koji obezbeđuju da prag odlučivanja uzima optimalne vrednosti, u skladu sa trenutnim nivoom korisnog signala i šuma u radarskom prijemniku.

Za potrebe realizacije CFAR algoritma upotrebljen je HERON IO-2 modul firme HUNT ENGINEERING, verzija V2, montiran na nosač modula HERON-BASE1 istog proizvođača. Signal u osnovnom opsegu se dovodi na ulaz A/D konvertora modula gde se digitalizuje, potom se pomoću FPGA obrađeni signal dovodi u digitalnom obliku na digitalni I/O port modula za dalju upotrebu u okviru sistema, odnosno prosleđuje na D/A konvertor zarad formiranja analognog oblika obrađenog signala.

U okviru FPGA čipa ulazni signal u osnovnom opsegu se filtrira pomoću digitalnog filtra. Kako ovaj filtar predstavlja kompresioni filtar, na njegovom izlazu se formira kroskorelaciona funkcija ulaznog signala i talasnog oblika anvelope radarskog signala koji se očekuje na ulazu u sistem. Kompresovani signal se potom dovodi na CFAR procesor. Kao izlazni signal iz CFAR procesora formira se digitalni signal alarma, čija je vrednost logičko „1“ ukoliko je cilj prisutan (premašena formirana vrednost praga odlučivanja), odnosno logičko „0“ ukoliko cilj nije prisutan u registru procesora (nije premašena formirana vrednost praga odlučivanja).

Upotreba FPGA tehnologije za potrebe efikasne i pouzdane obrade signala u radarskom prijemniku pruža brojne pogodnosti koje direktno odgovaraju potrebama savremenih radarskih sistema. Proces realizacije rešenja namenjenih obradi signala u radarskim prijemnicima pomoću FPGA je sasvim jednostavan, a reprogramabilna priroda ovih uređaja čini ih potpuno dostupnim za dalja unapređenja i eventualno dalje proširivanje njihove funkcionalnosti. Između ostalog, moguće je implementirati i druge varijante CFAR algoritma u okviru istog čipa, ako se kasnije ispostavi da ugrađeni ne zadovoljava određene uslove primene radara.

Radar PR-15 je, prema tome, po konstruktivno-tehnološkim rešenjima potpuno nov radar u familiji prenosnih izviđačkih radara. To je radar koji je tako koncipiran da se iz njega mogu izvesti pojednostavljene verzije, skromnijih taktičko-tehničkih mogućnosti i zbog toga jeftinijih, a koji se mogu uklapati u zahteve potencijalnih kupaca. Radar je projektovan na bazi tzv. otvorene arhitekture i sa najnovijim programabilnim tehnologijama, koje će omogućiti kasnija usavršavanja u tehnološkom smislu i u smislu poboljšanja taktičko-tehničkih mogućnosti a sve zavisno od zahteva potencijalnih kupaca.

The process of decision making itself is very important, necessary for determining the detection threshold. In PR-15 radar it is calculated within the constant false alarm level (CFAR) module. Namely, radar signal formed in the receiver is necessarily degraded by the presence of noise, induced interferences and ground clutter, all of which directly affect the decision making process.

In order to assume reliable operation of radar receiver detection system, therefore reliable operation of the complete radar system, it is necessary to provide operating conditions under which occurrence of false alarms will show specified, constant value throughout radar operation.

Namely, instead of operating using decision making threshold of constant value, it is necessary to apply adaptive algorithms for setting of decision making threshold: those algorithms which will ensure that decision making threshold has taken into account optimum values, in compliance with the level of useful signals versus noise present in radar receiver at the moment.

For application of CFAR algorithm, module HERON IO-2 made by HUNT ENGINEERING, version V2, has been used, mounted on support HERON-BASE1 of the same manufacturer. Base range signal is fed to A/D converter input where it is digitalized, thereafter FPGA processed signal in digital form is fed to digital I/O port for further use within the system, and resp. it is fed to D /A converter for analog image of the processed signal.

Within FPGA chip, base range input signal is filtered by means of digital filter. Since this is a compressing filter, at its output a cross-correlated function of input signal and waveform of radar signal envelope expected at input of the system is formed. Compressed signal is then fed to CFAR processor. Output signal from CFAR processor represents digital alarm signal, with the value of logical “1” – if a target is present (established decision making threshold exceeded) – or logical “0” if there is no target present within processor’s register (established decision making threshold not reached).

Application of FPGA technology in efficient and reliable radar receiver signal processing features numerous advantages of direct benefit to modern radar systems. Realization of data intended for signal processing in radar receivers by means of FPGA is very simple, while reprogrammable capability of that equipment makes it fully accessible for future improvements and possible further expansion of its functions. Among other matters, it is possible also to implement other versions of CFAR algorithms in the same chip, if it turns out later that incorporated algorithm fails to meet some radar operating applications.

By its design and technological properties radar type PR-15 is a completely new member of the family of mobile surveillance radars. It is a radar so designed to permit fabrication of simplified versions with more modest tactical-technical specifications, therefore of lower cost, that will meet specific requirements of potential customers. Radar is designed on the principle of so-called open architecture and uses latest programmable technologies that will permit subsequent technological advancements aimed at enhancing its tactical-technical capabilities, depending on specific needs of potential customers.

REALIZOVANI AKTUELNI PROJEKTI VOJNOTEHNIČKOG INSTITUTA

Piše
prof.dr Dragoljub Vujić

U broju 25 Y REPORT-a predstavljen je Vojnotehnički institut institut (VTI), prva i najveća vojna naučnoistraživačka ustanova u Republici Srbiji, (kao i u prethodnoj SFRJ) u oblasti tehničkih nauka i vojnih tehnologija koja je ove godine proslavila 60 godina postojanja i uspešnog rada. Da podsetimo, VTI je osnovan 3. novembra 1948. godine, a status naučnoistraživačke ustanove stekao je 1976. godine, kada je pod rednim brojem jedan (1) upisan u Registar vojnih naučnoistraživačkih ustanova. Za 60 godina postojanja i rada VTI je za potrebe vojske razvio preko 1.300 sredstava naoružanja i vojne opreme. Preko 75 procenata naoružanja i vojne opreme kojom je opremljena Vojska Srbije je razvijeno u VTI. Više od 90 procenata proizvodnog programa naše vojne industrije nastalo je u konstrukcionim biroima i laboratorijama VTI.

U ovom broju predstavljamo aktuelne značajnije realizovane projekte ovog izuzetno značajnog partnera Jugoimport-SDPR.

Protivoklopni raketni sistem BUMBAR

Jedan od najsloženijih projekata u vojsci, tačnije Vojnotehničkom institutu, započet još 1994. godine, ali je zbog nedostatka novca, njegov razvoj išao relativno sporo. Zahvaljujući, pre svega velikom entuzijazmu tima stručnjaka koji su svih ovih godina radili na ovom projektu, "Bumbar" bi uskoro trebalo da "uzleti", nakon završetka dizajniranja i završnih testova Tehničko-opitnog centra ovo moćno oružje trebalo bi da se zvanično uvede u naoružanje Vojske Srbije.

Protivoklopni sistem vođene rakete "Bumbar" je protivoklopna raketa malog dometa, ali velike probojnosti. To je lako prenosivo protivoklopno sredstvo za napadačka i odbrambena dejstva na malim daljinama. Ovo oružje mogu da koriste najniže taktičke jedinice pešadije, u svim borbenim situacijama. Mogućnost lansiranja "bumbara" i iz zatvorenog prostora, daje ovom odbrambenom oružju posebnu moć i ubojitost. Domet od oko 600 metara, što je nekoliko puta više od dometa klasičnih ručnih bacača raketa, odlično je prilagođen zoni neposredne protivoklopne odbrane pešadije.

Borbena autonomija i laka prenosivost, mogućnost dejst-

CURRENT PROJECTS REALIZED BY THE MILITARY-TECHNICAL INSTITUTE

By
prof.dr Dragoljub Vujić

Volume 25 of Y REPORT presented the Military-Technical Institute (VTI), foremost and largest institution for military research and development in the Republic of Serbia (as well as in former SFRY) in the field of technical sciences and military technologies which celebrates 60 years of existence and successful work this year. To recall, VTI was established on 3rd November 1948 and it received the status of a scientific research institution in 1976 when it was listed under No. 1 in the Register of military research and development institutions. In 60 years of its operation, VTI had developed over 1,300 products – weapons and military equipment. More than 75% of weapons and equipment in service with Serbian Army have been developed by VTI. Over 90% of products manufactured by domestic defense industry were created in design bureaus and laboratories of VTI.

This issue of our publication presents some more significant projects realized by this outstanding partner of Yugoimport-SDPR.

Anti-armor rocket system BUMBAR (Bumble Bee)

One of highly complex projects taken by the military, or more precisely by VTI, was initiated back in 1994 but, due to the lack of funds, its progress was relatively slow. Primarily owing to enthusiasm of the team of experts who kept working on the project all these years, Bumble Bee project is expected to "take off" soon; after completed design work and final tests by Army Test Center, this potent weapon should officially enter service with Serbian Army.

Anti-armor guided missile system "Bumble Bee" is an anti-armor rocket of short range but high penetrating power. It is a lightweight mobile anti-armor weapon for offensive and defensive engagements at short ranges. It can be used by smallest tactical infantry units in all combat situations. "Bumble Bee" can be launched in enclosed quarters which gives this weapon special potency and lethality. Its range is 600 m, being several times that of conventional handheld rocket launchers and it is extremely well suited for use

va iz zatvorenog prostora uz visoku efikasnost bojevih glava čine "bumbar" pogodnim za antiterorističke operacije, posebno u urbanim uslovima. Osim toga, kratak minimalni domet, 60 metara, na kome raketa efikasno može da se vodi do cilja, kao i velika verovatnoća pogađanja brzih, relativno malih, ciljeva na kratkim dometima do 200 metara, daju ovom oružju veliku prednost u uličnim borbama. Cena "bumbara" je višestuko niža od cene konkurentskih proizvoda na svetskom tržištu.

Predviđeno je da "bumbarom" rukuje jedan vojnik iz dvočlanog protivoklopnog tima. Drugi nosi, u zavisnosti od taktičke situacije, jednu, dve ili tri rezervne rakete. Na ciljevima do borbenih daljina od 300 metara raketa može da se lansira sa ramena, klečeći ili stojeći, a preko toga, ispaljuje se sa oslonca ili postolja. Ima mali demaskirajući efekat, što znači da "bumbar" strelcu daje mogućnost da prilikom lansiranja, može da sakrije iza zaklona vitalne delove tela i da isturi samo lansirnu cev.

Raketa se do cilja vodi pomoću uređaja za vođenje i lansiranje. Prema načinu vođenja, "bumbar" spada u sisteme druge, ali poseduje i neke osobine protivoklopnih sistema treće generacije. Na raketi postoji potpuno nov blok elektronike i prvi put će raketa ove generacije imati ugrađen računar. To znači da će raketa "Bumbar" imati određeni nivo inteligencije, koji će joj, u budućnosti, omogućiti jednostavnu konverziju u sistem treće generacije koji funkcioniše po principu ''lansiraj i zaboravi''. Raketom se upravlja vektorom potiska, a naoružana je tandem kumulativnom bojevom glavom za uništavanje najsavremenijih tenkova sa aktivno-reaktivnim oklopom.

Većina primenjenih rešenja su tehnološki i funkcionalno vrlo savremena, neka su i potpuno originalana, tako da raketni sistem "bumbar" predstavlja i značajnu tehnolšku legitimaciju vojne industrije Srbije.

within a zone of infantry close range anti-armor defense.

Autonomous in combat and easy to carry, able to fire from enclosed quarters and equipped with highly effective warhead, "Bumble Bee" is also well suited for anti-terrorist combat, especially in urban environment. Furthermore, its minimum range of 60 m at which missile can be reliably guided to target and high hit probability of fast, compact targets at ranges up to 200 m give this weapon an added edge in street fighting. The price of "Bumble Bee" is many times lower than prices of competitive products in world markets.

It is envisaged that "Bumble Bee" is operated by single soldier of a two members' anti-armor team. Second member of the crew carries one, two or three spare missiles, depending on tactical situation. At combat ranges up to 300 m, missile can be fired from the shoulder, in kneeling or upright position. At longer ranges, weapon is fired from support or pedestal. The weapon has negligible unmasking effect and shooter can keep vital parts of his body under cover, while protruding only the launch tube.

Missile is guided to target by guidance and launching unit. In the manner of guidance "Bumble Bee" belongs to second-generation systems, however it possesses certain attributes of third generation anti-armor systems. It incorporates completely new electronics module and, a first for this generation weapon, it has built-in computer. That means certain level of intelligence which will allow future conversion into a third generation "fire and forget" system. Missile is guided by vectored thrust and its tandem shaped charge warhead is able to destroy latest generation tanks employing active-reactive armor.

Most of the solutions used are technologically and functionally up to date, some are quite original and "Bumble Bee" system represents a credit to technological capabilities of Serbian defense industry.

YUGOIMPORT-SDPR

- maximum range 600 m
- soft launch sequence, enabling use from confined spaces
- compatible with urban warfare scenarios
- SACLOS (Semi-automatic command to line of sight) guidance
- High level of immunity against optical jamming
- 1000 mm RHA penetration, behind ERA box
- favorable human-machine interface

Bumbar (Bumble-bee)

short range guided anti-armour weapon system

Model vojnika pešadije za 21. vek

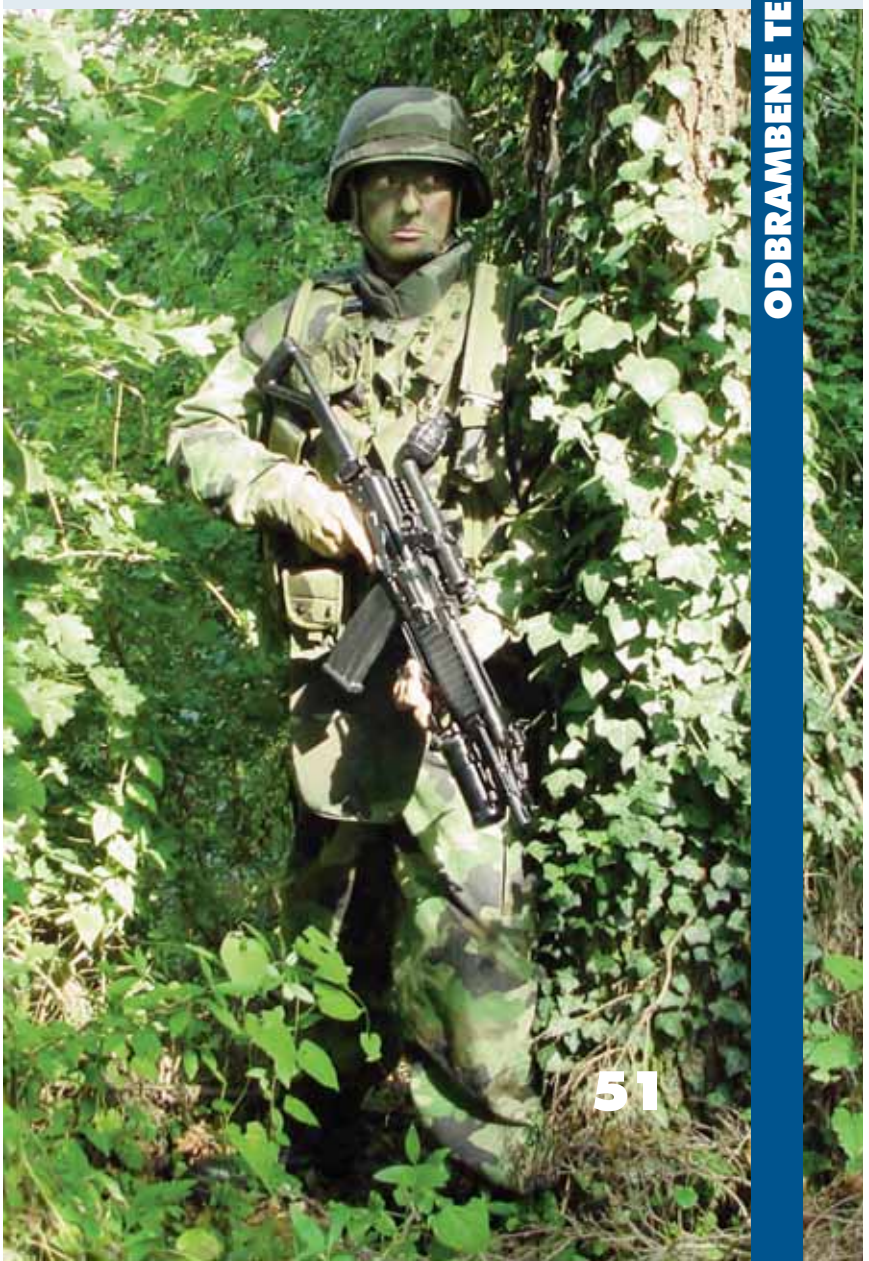
Rad na projektu je počeo sredinom devedesetih godina prošlog veka. Osnov za pokretanje projekta bila su pre svega iskustva stečena u borbenim dejstvima na teritoriji bivše SFRJ, a zatim i saznanja o razvoju modernog naoružanja i opreme namenjene prvenstveno vojnicima pešadije u većini armija razvijenih država sveta. Osnovni cilj tada, kao i danas, bio je da se poboljša borbena efikasnost vojnika pešadije ali i mogućnost preživljavanja u uslovima borbenih dejstava. Ključnu ulogu u razvoju naoružanja i opreme vojnika pešadije za 21. vek od samog početka je imao VTI. Multidisciplinarna znanja i veliko iskustvo omogućili su pokretanje razvoja, a potom i izradu, ispitivanje i konačno uvođenje u naoružanje i opremanje potpuno novih oružja, municije, sprava za nišanjenje i upravljanje vatrom, delova opreme za individualnu balističku zaštitu, zatim nova oprema ABHO zaštite, nova uniforma sa čizmama i čitav niz drugih sredstava. Pored modernizacije postojećih sredstava, pristupilo se i razvoju potpuno novih sredstava, pre svega u oblasti naoružanja, kao što je podcevni bacač granata koji se postavlja na postojeću dobro poznatu AP 7,62mm M70 i na novu PA 5,56mm M21 sa kompletom granata različitog dejstva. U okviru projekta uspešno je razvijena potpuno nova oprema za ličnu balističku zaštitu kao što su šlem i pancirni prsluk. Pored navedenog, razvijena je nova oprema ABHO zaštite u kojoj centralno mesto ima nova zaštitna maska, nova uniforma sa čizmama, sredstva za komunikaciju i čitav niz opreme.

Ipak ključni i centralni deo projekta predstavlja podsistem naoružanja sa kojim je integrisan podsistem optičkih i optoelektronskih nišanskih sprava i uređaja za upravljanje vatrom odnosno za gađanje iz automatske puške M21 u svim mogućim uslovima dnevnih i noćnih borbenih dejstava. Ovaj podsistem čine automatska puška kalibra 5,56mm M21, podcevni bacač granata kalibra 40mm, komplet različitih vrsta metaka za automatsku pušku i komplet različitih vrsta granata (parčadnog, probojnog, zapaljivog i dimnog dejstva) za podcevni bacač. Da bi bilo jasno koliku prednost daje moderno naoružanom vojniku pešadije, najbolje bi bilo poređenje sa vojnikom pešadije iz perioda Drugog svetskog rata. Vatrenim dejstvom iz automatske puške sa optičkim nišanom efikasnost se povećava za tri do četiri puta, a dejstvom iz potcevnog bacača granata za četiri do pet puta. Iz pomenutih poređenja jasno je da obučen vojnik pešadije početkom 21. veka po vatrenoj moći i efikasnosti dejstva prevazilazi odeljenje vojnika pešadije iz perioda Drugog svetskog rata ili još jasnije, on je u celini gledano za oko deset puta efikasniji. Primera radi, granatom parčadnog dejstva ispaljenom iz podcevnog bacača granata mogu vrlo precizno da se gađaju i ciljevi na daljini od oko 400 metara, a po ubojnosti ona je približno jednaka ručnoj bombi. Za jedan minut dobro obučen vojnik može da ispali oko pet granata, a vrhunski obučen vojnik može da ispali i preko deset granata, sada postaje potpuno jasno odakle potiče tolika vatrena moć pojedinca.

Preciznost gađanja, pouzdanost i efikasnost automatske puške M21 su zaista impozantni. U toku istraživanja, razvoja i uvođenja u serijsku proizvodnju vršena su složena i obimna ispitivanja uz stalno poboljšavanje i usavršavanje njene konstrukcije. Procenjuje se da je u toku konstruktorskih, trupnih i završnih ispitivanja puške M21 opaljeno više od tri

Model of infantryman for the 21st century

Project was initiated in mid-nineties of the last century. Primary reason for starting the project were experiences gained in the hostilities occurring within the former SFRY, also cognizance of development of new weapons and equipment primarily intended for infantrymen serving in armies of many developed countries. Basic assignment, then as today, was to enhance combat effectiveness of infantry soldiers and their ability to survive current combat environment. Key role in development of arms and equipment for infantrymen of the 21st century from the start was assigned to VTI. Multidisciplinary expertise and large experience enabled initiation of development, followed by fabrication, testing and finally adopting into service and outfitting with completely new weapons, ammunition, sighting and fire control equipment, personal equipment for ballistic protection, new CBR protection equipment, new uniforms and numerous other items. In addition to modernization of existing equipment, development of new products, primarily weapons, such as grenade launcher mounted on popular assault rifle cal. 7.62mm M70 and on new assault rifle cal. 5.56mm M21 with set of grenades for different applications. With the project, completely new equipment for personal ballistic protection including helmet and bulletproof vest were developed. In



stotine hiljada metaka kalibra 5,56 h 45mm. Ispitivanja su vršena u svim realno mogućim uslovima upotrebe ove vrste oružja ali i u uslovima koji su u stvarnosti skoro nemogući.

Podcevni bacač granata je kao vrsta oružja novijeg datuma. Masovnije uvođenje u naoružanje ove vrste oružja u svetu počinje tek u toku osamdesetih godina prošlog veka. U naoružanju bivše JNA ovo oružje jednostavno nije postojalo. Neophodnost za ovom vrstom oružja najbolje svedoči činjenica da je tokom borbenih dejstava na Jugoslovenskom prostoru sa početka devedesetih godina prošlog veka izrađeno, po grubim procenama, preko deset hiljada primitivnih bacača ručnih bombi. Razlog za ovo je upravo potreba za oružjem koje može da dobaci manje eksplozivno ubojno sredstvo na daljinu do koje ono rukom sigurno ne može da se dobaci.

Koliko je konstrukcija našeg podcevnog bacača granata 40mm superiornija u odnosu na podcevne bacače koji su u naoružanju nekih drugih armija najbolje svedoče sledeće činjenice: podcevni bacač se skida ili postavlja na oružje jednim jedinim potezom ruke, praktično trenutno, a za skidanje i postavljanje bacača drugih armija potreban je alat i vreme od 5 do 10 minuta. Druga i još bitnija prednost našeg podcevnog bacača je stvarna borbena brzina gađanja koja je zahvaljujući načinu punjenja najmanje dva puta veća u odnosu na druge.

U celini gledano, čitav projekat predstavlja veliki uspeh domaće pameti i naše industrije naoružanja i vojne opreme. Kada se uzme u obzir da su gotovo sve fabrike naoružanja teško oštećene tokom devedesetih godina prošlog veka, da su mnogi vitalni kapaciteti i oprema potpuno uništeni, da su angažovana novčana sredstva bila najblaže rečeno skromna, tek tada slika uspeha postaje potpuno jasna.

Automat 9mm M97 i M97K

Automati 9mm M97 i M97K su nastali kao novo oružje namenjeno pre svega pripadnicima specijalnih jedinica u vojsci i policiji, a potom i za naoružavanje posada borbenih vozila u kopnenoj vojsci, mornarici i vazduhoplovstvu. Automati se odlikuju velikom efikasnošću. Zahvaljujući razvoju i primeni novih vrsta municije, automatima 9mm M97 i M97K moguće je efikasno gađati i žive ciljeve koji su zaštićeni

addition, new CBR equipment consisting of new protective mask, new uniform with boots, communications equipment and numerous other items.

However, main focus of the project was directed towards weapon subsystem that integrates optical and optoelectronic sighting devices and fire control equipment for assault rifle M21 in all combat conditions, day and night. This subsystem comprises assault rifle M21, barrel-mounted grenade launcher cal. 40mm, set of different cartridges for the rifle and set of grenades (fragmentation, piercing, incendiary and smoke). To illustrate the advantages of modern infantry weapons comparison is offered with infantrymen of the WWII. Firepower from assault rifle fitted with optical sight fire effectiveness in increased 3-4 times; by adding barrel mounted grenade launcher effectiveness is increased 4-5 times. This comparison shows that trained infantryman at the outset of the 21st century exceeds a squad of infantry from the WWII period in firepower and effectiveness, or, in other words, modern soldier is 10 times more effective. To illustrate, a fragmentation grenade can be precisely fired on target about 400m away and its effect is similar to that of a hand grenade. Well trained soldier is able to fire up to 5 grenades in one minute, highly trained soldier can fire more than 10 grenades, and therefore it is clear how great fire power resides in an individual.

Accuracy of fire, reliability and effectiveness of automatic rifle M21 are truly impressive. During its research, development and introduction in series production complex and comprehensive test were carried out, accompanied by permanent improving and perfecting of its construction. It is estimated that over 300,000 cartridges cal. 5.56 x 45 mm have been fired during engineering, troop and final tests of M21 rifle. Firing tests were carried out in all conceivable conditions of use of this kind of weapon, but also in conditions which are not feasible in reality.

Sub-barrel mounted grenade launcher as type of weapon is of relatively recent date. Its massive use around the world took place in eighties of the last century. In arsenal of former YPA this weapon simply did not exist. The need for this type of weapon was reflected by the fact that during the hostilities within the territories of former Yugoslavia in early 1990-ies it is roughly estimated that over ten thousand crude hand grenade launchers have been made. The reason was the need for a weapon that can throw smaller explosive devices to distances not possible to reach by hand throwing.

That our sub-barrel grenade launcher cal. 40mm is superior to weapons of this type used by some foreign armies is testified by the following facts: our grenade launcher is mounted or removed from the rifle by single move of hand, practically instantly, compared to 5-10 minutes and use of special tool required by foreign grenade launchers. Another, more pertinent advantage of our grenade launcher is its actual rate of fire in combat which, owing to its loading method, is at least twice the rate of fire of other grenade launchers.

All in all, the entire project represents great achievement of indigenous expertise and of our defense industry. When one takes in consideration that almost all arms factories were

pancir prslucima. Preciznost gađanja automata je izuzetno visoka, a primenom integrisanih laserskih obeleživača cilja omogućeno je izuzetno brzo nišanjenje i u uslovima loše vidljivosti kao i brzo, skoro trenutno, prenošenje vatre sa cilja na cilj.

Uspešnom primenom najmodernijih i proverenih konstrukcionih rešenja postignuto je da automati 9mm M97 i M97K sa pravom mogu biti svrstani u sam vrh svetskih oružja ove vrste. Poseban kvalitet ovih oružja predstavlja visoka pouzdanost funkcionisanja i to u najekstremnijim uslovima temperature, vlage, zaprljanosti peskom, prašinom ili blatom. U direktnom poređenju sa svetski najpoznatijim automatima, automati 9mm M97 i M97K su daleko superiorniji baš u pogledu pouzdane funkcije pri gađanju što u realnim borbenim uslovima ima nesumnjivo presudan značaj, ne samo zbog uspešnog izvršenja konkretnog borbenog zadatka, nego i zbog realne mogućnosti preživljavanja pripadnika specijalnih jedinica koji su naoružani ovim automatima.

Automatska puška 5.56 mm M21 sa podcevnim bacačem granata 40 mm i optičkim nišanom

Kompleksnost borbenog polja u 21. veku zahteva pešadijsko oružje velikih mogućnosti, koje funkcioniše i u najtežim klimatskim i terenskim uslovima. Rešenje za to su automatske puške 5,56mm M21 i jurišna automatska puška 5,56mm M21S. Ove puške su konstruisane da omoguće uspešna borbena dejstva u najsloženijim i najekstremnijim borbenim uslovima koje nameće moderno ratovanje.

Puška ima ugrađenu šinu, koja omogućava montažu svih optičkih uređaja koji odgovaraju NATO standardu. Ovi uređaji omogućuju uspešno gađanje u svim dnevnim i noćnim uslovima. Zahvaljujući brzom i jednostavnom postavljanju podcevnog bacača granata kalibra 40mm u borbenim uslovima, modernom vojniku pešadije je omogućeno da za samo par sekundi može da uspešno gađa grupne ciljeve i lako oklopljena vozila, čak i na daljinama od 350 do 400m.

Pouzdanost funkcionisanja i preciznost gađanja su osnovne i najbitnije odlike puške M21. Pouzdanost ove puške svrstava je u danas najbolja oružja. Ekstremna ispitivanja kojima je bila izložena u toku razvoja su pokazala su njenu izuzetnu izdržljivost, funkcionalnost i pogodnost za rukovanje i gađanje.

heavily damaged in the nineties of the last century, that a number of vital capacities were totally destroyed and that available funds were at least inadequate, only then one can comprehend the magnitude of the success.

Submachine gun cal. 9mm M97 and M97K

Submachine gun cal. 9mm model M97 and M97K was designed as new weapon primarily intended for use by army and police special forces, also as personal weapon for the crews of combat vehicles in land forces, navy and air force. Due to development and introduction of new types of ammunition, cal. 9mm submachine guns M97 and M97K are effective against manpower protected by protective vests. Firing accuracy of new submachine guns is exceptionally high and by fitting of integrated laser target markers, rapid aiming in the conditions of poor visibility and quick, almost instant fire transfer to another target is possible.

Applying most advanced and well-proven design solutions, submachine guns cal. 9mm type M97 and M97K rightly belong to the best in the world in that category. Particular quality of these weapons is their high reliability in use in extreme conditions of temperature, humidity and contamination by sand, dirt or mud. In direct comparison with internationally best-known submachine guns, weapons type M97 and M97K cal. 9mm are by far superior in their functional reliability of fire – decisive factor in real combat environment, not only for successful mission accomplishment, but also for survival of special forces armed with these submachine guns.

Assault rifle cal 5.56mm with sub-barrel grenade launcher cal. 40mm and optical sight

Complexities of 21st century battlefield call for infantry weapons of high potency, able to function in most adverse climatic and terrain conditions. Solution of that problem is found in automatic rifle M21 cal. 5.56mm and assault rifle M21C cal. 5.56mm. These weapons were designed for successful combat engagements in most complex and extreme combat environment imposed by modern warfare.

The rifle is fitted with rail that permits mounting of all optical devices made against NATO standards. These devices enable successful firing in day and night conditions. Owing to quick and simple attachment of sub-barrel grenade launcher cal. 40mm in combat conditions, modern infantryman is enabled, within a few seconds only, to engage group targets and lightly armored vehicles at ranges of up to 350-400m.

Functional reliability and firing accuracy are main and most essential features of the M21 rifle. Reliability of this rifle places it among the best weapons today. Comprehensive tests conducted during its development have resulted in exceptional durability, functional reliability and suitability in handling and firing. Wide range of accessories ensures successful application of the rifle in all environments of modern combat. In other words, M21 is a universal weapon, suitable for use by infantry, as well as by members of army and police special forces.

Širok dijapazon predviđene opreme omogućava pušci M21 da bude uspešno primenjena u svim uslovima modernog ratovanja. Drugim rečima, puška M21 je univerzalno oružje, ne samo za vojnike pešadije nego i za pripadnike specijalnih jedinica vojske i policije.

Automobil terenski FAP 1118 4x4

Automobil terenski FAP 1118 4H4 je terenski automobil za koji je VTI nosilac razvoja, a proizvođač je FAP iz Priboja. Završen je i ispitan prototip ovog vozila, a do kraja godine predstoji realizacija prototipske partije. Ovo vozilo namenjeno je za prevoz ljudstva, transport oruđa i materijala ukupne mase do 4t, kao i za vuču oruđa i priključnih sredstava.

Zahvaljujući pogonu na sva četiri točka, mogućnosti blokade svih diferencijala i snažnom dizel motoru može, krećući se van puteva, da savlada uspon od 60 %. Sistem za centralnu regulaciju pritiska vazduha u pneumaticima mu omogućava veliku prohodnost i po mekom terenu, a dobre geometrijske karakteristike savladavanje prirodnih i veštačkih prepreka, kao što su rov, pružni nasip, eskarpa i slične.

Cross-country truck FAP 1118 1118 4x4

This is an all-terrain vehicle developed by VTI and scheduled for production by FAP factory in Priboj. Its prototype was completed and tested and a trial lot is scheduled for realization by the end of this year. It is designed for transport of personnel, weapons and material of up to 4t gross weight, as well as for towing of artillery pieces and trailers.

Equipped with all-wheel drive, locking of all differentials and powerful diesel engine, the vehicle is able to negotiate cross-country gradients of 60%. Central regulation of tire pressure assures high mobility over soft soil and its well thought out body geometry enables easy negotiating of natural and man-made obstacles such as trenches, railway embankments, escarps etc.

Combat engineers' vehicle MUNJA (Lightning)

VTI has made design concept and Overhaul Depot Cacak has completed the general-purpose engineer vehicle MUNJA. Main idea was converting of T-55 tank, using its main construction and subsystems and adding new components, equipment and devices to derive a vehicle for entirely different purposes. Good terrain negotiating ability and ballistic protection of T-55 tank were retained, while engineer

Borbeno inžinjerijsko vozilo MUNJA

VTI je koncipirao rešenje, a Tehnički remontni zavod Čačak realizovao novo univerzalno inžinjerijsko vozilo MUNJA. Osnovna ideja je bila da se izvrši konverzija tenka T-55, iskoriste njegova osnovna konstrukcija i podsistemi, dodaju novi elementi, uređaji i oprema i time dobije novo sredstvo sasvim druge namene. Zadržana je dobra prohodnost i balistička zaštita tenka T-55, i ugrađena inžinjerijska oprema i naoružanje. Vozilo predstavlja prvo oklopno sredstvo roda inžinjerije koje svojom specifičnom opremom, inžinjerijskim kompletima i respektivnim naoružanjem spada u red najsavremenijih sredstava te vrste.

Namenjeno je za savladavanje prirodnih i veštačkih preprека, zaprečavanje, utvrđivanje, uređenje puteva i bezbedno prevoženje posade i inžinjerijske opreme u borbenim uslovima.

Konstruktori VTI su vrlo efikasno obezbedili prostor za smeštaj osam članova posade (dva stalna – vozač i zamenik komandira, ujedno i nišandžija na automatskom bacaču granata kalibra 30mm i mitraljezu 7,62mm i ukrcni deo - komandir i pet pionira). Takođe, ostvaren je i prostor za smeštaj inžinjerijskih kompleta i opreme, kao i za ugradnju turela komandira i nišandžije i ostalih potrebnih uređaja.

Prostor za smeštaj ljudi, kompleta, sklopova i opreme dobijen je uklanjanjem kupole, isecanjem dela krovne ploče i postavljanjem nadgradnje, izrađene od pancirnih ploča i limova, što posadi i ugrađenim kompletima i opremi pruža odgovarajuću balističku zaštitu. Pancirne ploče su debljine do 25mm, a postavljene su tako da obezbeđuju balističku zaštitu od pogodaka zrna kalibra 12,7mm. Krovna, horizontalna ploča nadgradnje izrađena iz više delova radi ugradnje odgovarajućih otvora. Na nadgradnji su izrađeni otvori za montažu turela komandira i nišandžije, dva desantna poklopca

equipment and armament were refitted. It is the first armored vehicle for engineer corps outfitted with special purpose engineer equipment and respectable armament, belonging to most modern vehicles of this kind.

It is designed for negotiation of natural and man-made obstacles, blocking, fortifying and repair of roads and for safe transporting of engineer teams and equipment in combat conditions.

VTI designers have thoughtfully arranged accommodation for 8 members of the crew (2 permanent members – driver and deputy commander, also gunner on automatic grenade launcher cal. 30mm and machine gun 7.62mm, and 6 embarked crew – commander and section of five pioneers). Room was also provided for sets of engineer equipment, for mounting of commander's and gunner's cupola and associated equipment.

Space needed to accommodate personnel and sets of special equipment was obtained by removing tank turret, cutting away section of hull roof plate and by refitting of superstructure consisting of armor plates and sheet metal that provides adequate ballistic protection of on-board crew and equipment. Armor plates are up to 25mm thick and so mounted to provide ballistic protection from cal. 12.7mm bullets. Horizontal roof plate of superstructure is made of several sections to provide necessary hatches. Openings are provided for fitting of commander's and gunner's cupolas, two access and evacuation hatches for engineer section, holes for radio set antenna, rotating periscope, driver's cover, refueling port and two lookout ports (for observation and for firing personal weapons). To perform engineering tasks, tank-grade blade it fitted at front, equipped with electric motor, pump and hydraulics. Blade assembly is an autonomous unit that can be quickly and easily attached to the hull. Vehicle firepower consists of one automatic grenade launcher 30mm and one machine gun M84, cal. 7.62mm.

Vehicle concept permits outfitting of weapons group station consisting of cal. 30mm gun, machine gun cal. 7.62mm, antitank wire guided rockets and automatic grenade launcher cal. 30mm with appropriate optoelectronic fire control system.

To protect the crew from radiological and chemical agents a modified radiological-chemical protection unit is built-in, consisting of anti radiation fan. This is automatically activated in case of nuclear shock wave. Protection from shaped charges consists of very effective skirts against shaped charges.

For masking protection, MUNJA was designed for protection in all ranges of electromagnetic spectrum (visual, close IR, radar and thermal parts of the spectrum). For masking and jamming of guided projectiles, the vehicle is equipped with smoke pots launcher and control panel identical to those mounted on M-84 tanks. Smoke charge launchers are mounted in front section of tracks covering plates. MUNJA integrates all equipment needed for specific engineering combat missions (crossing of artificial obstacles, making of barriers, road making and fortifying). Owing to modern positioning system, MUNJA can be tracked on virtual map while newly developed software enables the use of advanced computer technologies in execution of engineering works.

YUGOIMPORT-SDPR

UNIVERZALNO INŽINJERIJSKO VOZILO
COMBAT PIONEER VEHICLE

• inzenjerijski komplet •
• enginner kit •
• automatski bacac granata 30 mm •
• 30 mm automatic grenade launcher •
• mitraljez 7.62 mm •
• 7.62 mm general purpose machine gun •
• poboljsana oklopna zastita •
• improved armour protection •

MUNJA

za ulazak i izlazak pionirskog odeljenja, otvori za antenu radio uređaja, rotacioni periskop, poklopac vozača, nalivanje goriva, kao i dva otvora za puškarnice (osmatranje iz vozila i dejstvo iz ličnog naoružanja). Za izvršavanje inžinjerijskih zadataka na prednjem delu je ugrađena tenkovska ralica sa elektromotorom, pumpom i hidrauličkim komponentama. Ona predstavlja potpuno autonomnu celinu koja se brzo i jednostavno montira na oklopno telo tenka. Vatrena moć je obezbeđena ugradnjom automatskog bacača granata 30mm i mitraljeza M-84 kalibra 7,62mm.

Koncept vozila omogućuje ugradnju savremene daljinski upravljane oružne stanice sa topom 30 mm, mitraljezom 7,62 mm, protivoklonim vođenim raketama i automatskim bacačem granata 30 mm i odgovarajućim optoelektronskim sistemom za upravljanje vatrom.

Da bi posada bila zaštićena od dejstva radioloških i hemijskih agenasa ugrađen je modifikovani radiološko-hemijski uređaj, koji se sastoji od ventilatora protiv-atomske zaštite. Ovaj uređaj omogućuje automatsko aktiviranje pri zaštiti od nuklearnog udarnog talasa. Da bi se ostvarila zaštita od dejstva kumulativnih projektila na vozilu su postavljeni protivkumulativni štitnici sa veoma efikasnim zaštitnim svojstvima.

U oblasti maskiranja MUNJA je projektovana tako da ima zaštitu u svim delovima elektromagnetnog spektra (vidnom, bliskom IC, radarskom i termalnom delu spektra). U cilju maskiranja i ometanja vođenih projektila ugrađen je sistem bacača dimnih kutija i komandni pult, koji postoje na tenku M-84. Bacači se ugrađuju na prednjem delu nadguseničnih ploča. U MUNJI je integrisana oprema koja pruža mogućnost izvršavanja zadataka u svim sadržajima inžinjerijskih borbenih dejstava (savlađivanje veštačkih prepreka, zaprečavanje, uređenje puteva i utvrđivanje). Zahvaljujući savremenom pozicionom sistemu MUNJA pruža mogućnost praćenja prilikom kretanja na podlozi virtuelne karte, a novoizrađeni softver omogućava korišćenje savremene računarske tehnologije pri izvođenju inžinjerijskih radova.

Uporedno sa razvojem MUNJE, u opremu inžinjerije, uveden je i komplet borbene opreme za vojnike pionirske specijalnosti, koja se takođe svrstava u sam vrh sradstava te vrste. Da bi se izbegla opasnost od eksplozije goriva i požara u slučaju proboja balističke zaštite, ugrađen je podsistem za zaštitu od eksplozije goriva i požara. On je autonomni, automatski, opremljen optičkim detektorima sa UV i IC senzorima, čije se vreme detekcije i aktiviranja meri u hiljaditim delovima sekunde. Pokretljivost univerzalnog inžinjerijskog vozila MUNJA je na nivou tenka T-55, ali se može povećati ugradnjom motora povećane snage i savremene transmisije, pre svega modularne pogonske grupe MPG-780 sa motorom od 780 KS, zamenljive u poljskim uslovima. Univerzalno inžinjerijsko vozilo MUNJA se može vrlo uspešno koristiti u mirovnim i humanitarnim misijama. Realizovani model vozila predstavlja osnovu za razvoj familije oklopnih guseničnih borbenih vozila, a pre svega teškog oklopnog transportera sa znatno višim nivoom sverakursne balističke zaštite od savremenih klasičnih oklopnih transportera i borbenih vozila pešadije.

In parallel with development of MUNJA, engineer units were supplied with combat sets of specialist pioneer equipment which also ranks among the best in that category. To prevent fuel explosions and resulting fires in the event of penetration of ballistic protection, a fuel explosion and fire prevention system has been fitted. It is autonomous, provided with UV and IR sensors with detection and activation time measured as thousands of a second. Mobility of MUNJA engineer vehicle is a the level of T-55 tank but it could be further improved by retrofit of higher power engine and modern transmission, in particular of modular power pack MPG-780 featuring the engine developing 780 HP. Power pack is replaceable in field conditions. General purpose engineer vehicle MUNJA can be well used in peacekeeping and humanitarian missions. Developed model represents the base for development of a family of tracked armored combat vehicles; in particular of armored personnel carrier possessing considerably higher level of all-round ballistic protection compared to current conventional APC-s and IFV-s.

Fuel explosion and fire prevention subsystem

Nowadays, greatest hazard for the crew, subsystems and

equipment in tanks and other armored vehicles is a hit of ammunition or fuel tank by shaped charge projectile, which inevitably causes explosion. Research carried out in this area and development of a subsystem for protection from fuel explosion and fire was based exclusively on domestic capacities.

Main components of the subsystem comprise optical detectors, sensitive to radiation of high-energy particles of shaped charge jet or incendiary projectile, electronic device that manages protection, bottles with protective agent, sensors of minimum pressure and mechanism for quick discharge including appropriate electrical installation. Bottles with fire-fighting agent are activated by pyrotechnical elements, causing the agent to flow directly into protected area (without any piping). A hand-held mobile pressure gauge has been developed that measures the pressure of protective agent, without removing the bottle from the vehicle.

Podsistem za zaštitu od eksplozije goriva i požara.

Za sada, najveću opasnost za posadu, podsisteme i uređaje u tenkovima i drugim oklopnim sredstvima predstavlja slučaj pogotka municije ili rezervoara za gorivo kumulativnim projektilom, pri čemu se obavezno javlja eksplozija. Istraživanja u ovoj oblasti kao i razvoj podsistema za zaštitu od eksplozije goriva i požara, zasnovani su isključivo na domaćim kapacitetima.

Osnovne komponente podsistema su: optički detektori, osetljivi na zračenje visokoenergetskih čestica kumulativnog mlaza ili zapaljivih projektila, elektronski uređaj za kontrolu i upravljanje zaštitom, boce sa zaštitnim sredstvom, senzorima minimalnog pritiska, i mehanizmom za brzo aktiviranje i pražnjenje i odgovarajuća elektroinstalacija. Za aktiviranje boca se koristi energija pirotehničkih elemenata, a zaštitno sredstvo iz boca ističe direktno u štićeni prostor (bez cevovodne instalacije). Razvijen je i ručni mobilni indikator pritiska kojim se može, bez vađenja boca iz tenka, izmeriti pritisak zaštitnog sredstva.

Uređaj za zaštitu motora tenka od nepravilnog startovanja

Uređaj je namenjen za zaštitu motora od nepravilnog startovanja. Ovaj veoma efikasan uređaj obezbeđuje zvučnu i svetlosnu signalizaciju prekoračenja temperature rashladne tečnosti motora, ili isključenja pogona ventilatora za hlađenje motora. Cena komponenata uređaja i njegove ugradnje iznosi oko 5 procenata od cene motora, što je sa ekonomske strane gledišta veoma isplativo.

Equipment for engine protection against improper starting

The equipment serves to prevent engine damage in case of improper starting procedure. This highly effective device provides audible and visible signalization for excess temperature of engine cooling liquid or failure of engine cooling fan. Cost of components of the equipment is only 5% of the engine cost; therefore investing in this device is highly profitable.

Main components of the equipment – a micro controller unit and electro-pneumatic valve, which were initiated and developed by VTI, are approved and used by Serbian Army.

Upgraded air defense missile system NEVA

Designed to detect, track and destroy aerial targets at low and medium altitudes, day and night and in conditions of reduced visibility, it features enhanced resilience against electronic jamming. Testing of zero lot of that system was completed in 2007. The system was retrofitted with advance optoelectronic devices comprising electrical and mechanical interface.

Upgraded G-4 SUPER GALEB aircraft

Top achievement in development of indigenous trainer/combat aviation, jet trainer Super Galeb G-4 was introduced in mid-eighties and has gained international recognition as a very advanced aircraft within the category of trainer-combat planes, next to the British Hawk and French-German Alpha Jet. G-4 was designed for initial and conversion training of our jet fighter pilots, as replacement for the G-2 Galeb; it is a completely different aircraft that only shares the family name with its predecessor. G-4 adopted numerous new technologies in aircraft development and fabrication, acquired by VTI in the course of development of our

Osnovne komponente uređaja, mikrokontrolerski bazirana upravljačka jedinica i elektropneumatički ventil, čiji je razvoj pokrenut i realizovan u VTI, usvojene su u opremu Vojske Srbije.

Usavršeni raketni sistem protivvazdušne odbrane NEVA

Namenjen je za otkrivanje, praćenje i uništavanje ciljeva u vazdušnom prostoru na malim i srednjim visinama, danju i noću, u uslovima ograničene vidljivosti uz povećanu otpornost na elektronsko ometanje. Tokom 2007. godine završeno je ispitivanje nulte serije ovog sistema. U sistem su ugrađena savremena optoelektronska sredstva sa električnim i mehaničkim interfejsom.

Modernizovani avio G-4 SUPERGALEB

Svojevrsni vrhunac u razvoju domaće školsko-borbene avijacije, predstavlja mlazni avion G-4 Super Galeb, koji je svojim pojavljivanjem sredinom osamdesetih godina, dobio svetska priznanja kao vrlo savremeno rešenje, svrstavajući se odmah u vrh klase školsko borbenih aviona, neposredno iza lidera u klasi, britanskog aviona Hawk i francusko-nemačkog Alpha Jet. Avion je projektovan za letačku i borbenu obuku vojnih pilota kao zamena za avion G-2 Galeb u odnosu na koga predstavlja potpuno novo rešenje, zadržavajući po tradiciji, samo ime prethodnika. U razvoju aviona je primenjen niz novih tehnologija u projektovanju i izradi aviona koje je VTI osvojio kroz razvoj mlaznog borbenog aviona Orao, prvog domaćeg aviona koji je probio zvučni zid. Po svojoj koncepciji avion je prilagođen letu visokopodzvučnim i blago krozzvučnim brzinama u širokom rasponu visina leta što omogućava obuku pilota u vrlo sličnim uslovima leta borbenih aviona. Sa visokim manevarskim sposobnostima i dobrim ponašanjem u letu, G-4 je brzo stekao reputaciju odličnog školskog aviona a zahvaljujući solidnom topovskom, bombarderskom i nevođenom raketnom naoružanju, pokazao se kao dobar i za borbenu upotrebu.

strike aircraft Orao, first indigenous aircraft to break the sound barrier. In its concept, G-4 was designed to fly at high subsonic and a portion of trans-sonic speeds, within wide range of flight altitudes, enabling pilot trainees to fly in the manner similar to flying jet fighters. Its high maneuverability and good controllability in flight quickly gained recognition of G-4 as an exceptional trainer aircraft while, owing to its solid gun, bomb and unguided rocket armament, G-4 proved itself in combat missions.

Super Galeb G-4 proved its merits in Serbian Air Force and Air Defense and it was assessed that its flight performance meets the requirement of modern pilot training so that, based on existing resources, G-4 may remain in service even past year 2020. On the other hand, built-in avionics and weapon systems are inadequate to provide proper pilot training of pilots who will fly fighter aircraft of fourth and fifth generations. Therefore the need to upgrade the aircraft by retrofitting advanced digital cockpit avionics and interfaces for mounting of modern guided weapons for air and ground targets. Instead of conventional instruments, pilot would have electronic displays: head-up display for flight and target parameters and two head-down displays with other flight and navigation parameters and moving map of terrain. Together with advanced navigation and communications equipment, it will be required to introduce new systems for combat in-flight training and ground stations for flight briefing and debriefing. This would enable pilot trainees to use most modern avionics as fitted to latest combat aircraft. This would ensure considerably higher quality of training and easier pilot transition to modern combat airplanes.

Modernized trainer aircraft would enable 6-8 times cheaper pilot training compared to training in two-seat trainer version of fighter aircraft. Based on such cost savings in pilot training, funds invested to modernize trainer aircraft would be completely recovered during the use of so upgraded trainers. Armed with air-air missile, TV and laser guided bombs

G-4 Super Galeb se odlično pokazao i u Vazduhoplovstvu i Protivvazduhoplovnoj odbrani Vojske Srbije gde je ocenjeno da po svojim letnim osobinama zadovoljava zahteve savremene letačke obuke i da na osnovu još uvek dovoljno raspoloživih resursa, može ostati u upotrebi i posle 2020. godine. Međutim, postojeća avionska elektronska oprema (avionika) i sistem naoružanja ne omogućuju adekvatnu obuku pilota za najnovije borbene avione četvrte i pete generacije, pa se nameće potreba za modernizacijom aviona, sa težištem na uvođenju savremene digitalne avionike u pilotskim kabinama kao i na osposobljavanju aviona za korišćenje savremenih vođenih ubojnih sredstava za dejstvo po ciljevima u vazduhu i na zemlji. Umesto klasičnih instrumenata pilot bi sada ispred sebe imao elektronske prikazivače gde bi se na gornjem (Head-Up-Display) prikazivali letni i nišanski parametri a na dva donja (Head-Down-Display), preostali letni i navigacioni parametri kao i pokretna mapa terena. Uz savremenu navigacionu i komunikacionu opremu, uveli bi se i novi sistemi za borbenu obuku u letu kao i zemaljske stanice za pripremu leta i posleletnu analizu. Ovim bi se omogućila obuka učenika-pilota za upotrebu najsavremenije avionike koju imaju najnoviji borbeni avioni. Bila bi obezbeđena znatno kvalitetnija obuka i mnogo lakši prelazak učenika na savremene borbene avione.

Modernizovani avion bi omogućio 6 do 8 puta jeftiniju obuku pilota nego da se ona odvija na dvosedoj verziji borbenog aviona. Na osnovu ostvarenih ušteda u obuci i treningu pilota, uložena sredstva u modernizaciju aviona bi se u potpunosti isplatila tokom upotrebe modernizovanog aviona. Sa raketama vazduh-vazduh i televizijski i laserski vođenim bombama i raketama vazduh–zemlja, avion bi u pomoćnoj nameni predstavljao i značajan borbeni sistem lovačko-bombarderske avijacije.

Obzirom da u zemlji nemamo razvoj i proizvodnju savremene avionike, u saradnji sa nekoliko stranih kompanija koje se bave modernizacijom aviona, Vojnotehnički institut je definisao rešenje sistema modernizacije avionike i neophodnih radova na avionu.

Avion za početnu obuku pilota LASTA 95. Avion je projektovan po postojećim svetskim standardima i namenjen je za početnu obuku pilota, izvođenje akrobatskih letova i za selekciju kandidata u vojnim akademijama. Performanse aviona Lasta 95 omogućavaju ostvarenje definisanog nivoa početne i osnovne obuke i jednostavan prelaz na avione za viši nivo obuke.

Avion je nastao na iskustvima stečenim tokom razvoja aviona Lasta-1 i Lasta-2 pri čemu su osnovna poboljšanja izvedena u: povećanju bezbednosti, poboljšanju komfora, povećanoj tolerantnosti aviona u prevučenom letu, smanjenju brzina prilaza i sletanja, mogućnosti jednostavnog izvođenja kosih i vertikalnih elemenata figurnog letenja.

Lasta 95 je jednomotorni niskokrilac, metalne konstrukcije sa dva pilotska sedišta jedno iza drugog i uvlačećim voznim organima tipa tricikl koji mu omogućavaju operativnu upotrebu sa betonskih i pripremljenih travnatih poletno sletnih staza.

Pogonsku grupu aviona čini jedan klipni motor, bez reduktora i sa vučnom elisom konstantnog broja obrtaja. Avion je opremljen savremenom elektronskom opremom koja zadovoljava sve postojeće međunarodne standarde i koja omogućava GPS i radio navigaciju.

and air-ground missiles, upgraded trainer aircraft would represent significant auxiliary fighter-bomber asset.

Since there is no development or production of advanced avionic equipment within the country, in cooperation with selected foreign manufacturers versed in military aircraft upgrading, VTI has defined concept of avionics retrofit and other works required in aircraft upgrading.

Initial pilot trainer aircraft LASTA 95. This aircraft was designed according to existing world standards and it was built to serve for basic pilot training, for aerobatics and selection of candidates for pilots in military academies. Flight performance of Lasta 95 meet the requirements for initial and basic training enabling easy transition to higher level of training.

The aircraft was derived from experiences gained in development of the types Lasta-1 and Lasta-2, with major improvements of safety, better comfort and higher aircraft tolerance at stalling speed, reduced approach and landing speeds, simplified execution of banked and vertical elements of figure flying.

Lasta 95 is a single-engined low wing airplane of metal construction with two tandem seats and retractable tricycle landing gear, able to operate from concr□te and prepared grass runways.

Sistem mini bespilotne letelice

Mala bespilotna letelica (MBL) je predviđena za misije bliskog dnevnog i noćnog izviđanja i osmatranja. Pri konstruisanju je posebno vođeno računa o jednostavnosti upotrebe i rukovanja, pa tako i za faze treninga i uvežbavanja posade. Osnovna misija je da posredstvom opto-elektronskog TV sistema (CCD ili IC kamere), prenosi video informacije sa terena koje nadleće. Izviđačka misija uključuje identifikaciju ciljeva i obezbeđenje podataka o njihovoj poziciji komandno-operativnim i kontrolnim centrima. U normalnim uslovima letelica poleće izbačajem iz ruke, dok se sletanje obavlja prevlačenjem letelice tokom faze ravnanja na visini neposredno iznad visine tla.

Osnovna karakteristika letelice je izražena modularnost njene konstrukcije kako bi se uprostilo terensko manipulisanje i omogućilo nošenje alternativnih korisnih tereta. Zmaj letelice je aerodinamički koncipiran kao monoplan, visokokrilac u konfiguraciji sa trupom i jednom repnom gredom koja nosi vertikalni i horizontalni rep. Izabrana je šema sa prednjim položajem motora i vučnom elisom fiksnog koraka radi bezbednog starta letelice iz ruke operatera i jednostavnije ugradnje elektro motora. S obzirom da je sva oprema letelice smeštena u trupnoj gondoli. Ovakva konfiguracija ne remeti senzorska vidna polja. Letelica je u potpunosti prilagođena lakoj eksploataciji, posebno brzom i lakom sastavljanju i rastavljanju u terenskim uslovima od strane operatora, bez posebnih alata.

Zmaj letelice je proizveden od savremenih kompozitnih materijala, a na mestima uvođenja koncetrisanih opterećenja su lokalna ojačanja u vidu umetaka sa više slojeva. Krilo letelice je jednoramenjačnot i p a monokok, a oplata je izvedena od sendvič konstrukcije. Trupna gondola sa konzolom za vezu repne grede je podeljena u nekoliko odseka koji određuju raspored unutrašnje strukture koja je sendvič konstrukcije sa tehnološkim otvorima i potrebnim ojačanjima. Repna greda je integrisana sa vertikalnim repom i na njoj su veze sa konzolom na trupnoj gondoli. Pogonski sistem se sastoji od elektromotora maksimalne izlazne snage od 300-600 W.

Razmah krila letelice je 2,8m, površina 0,75 m2, dužina trupa 1,94 m, a visina letelice 0,47 m. Maksimalna masa letelice na poletanju je 5 kg, a masa opreme za misiju 0,9 kg.

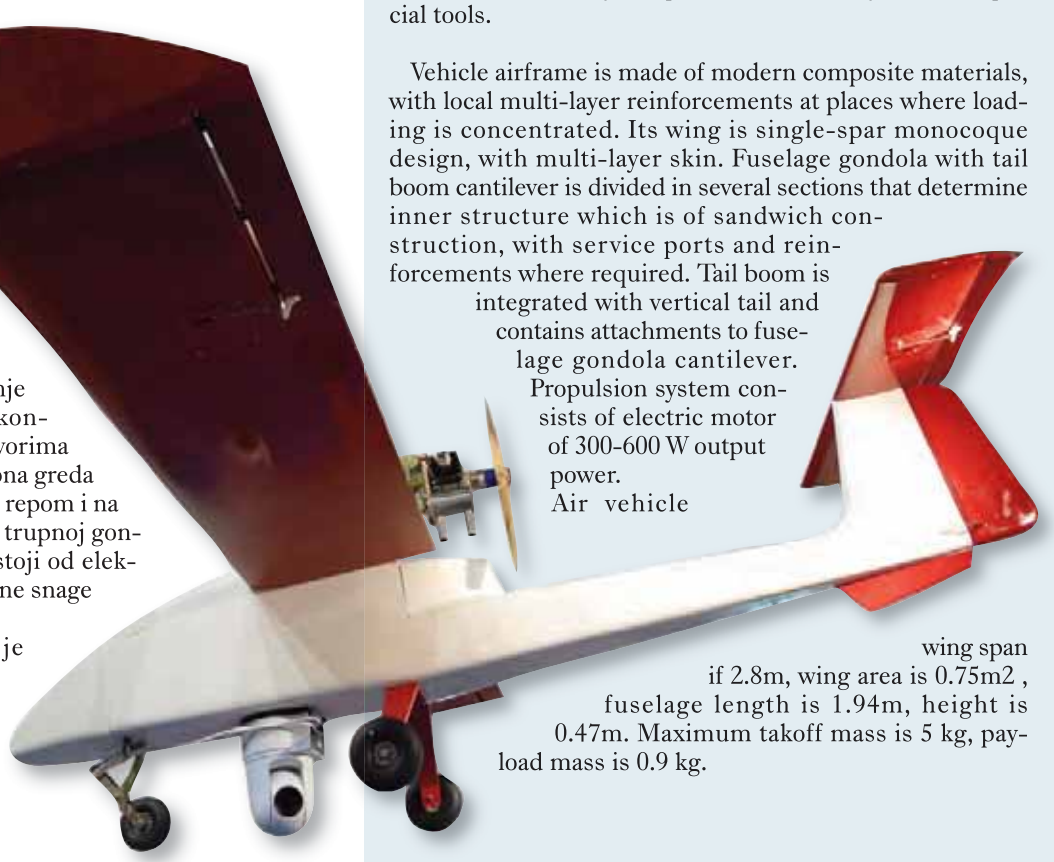
It is powered by single piston engine, without reduction gear and with pulling propeller of constant r.p.m. The aircraft it outfitted with modern avionics that meet all international standards and enable GPS and radio navigation.

Mini unmanned air vehicle systems (MBL)

Miniature unmanned air vehicles are envisaged for close range reconnaissance, day and night. During their design, special care was attached to simplicity of use and handling, including training phases of operating crew. Their main mission is to transmit video information on overflown terrain, obtained by optoelectronic TV systems (CCD or IR cameras). Reconnaissance includes target identification and provision of data on their positions to land command and control operation centers. In normal conditions, air vehicle is launched by hand, whereas its landing is at stalling speed, in horizontal flight, at minimum altitude above the ground.

Main feature of miniature unmanned air vehicle is its modular construction that simplifies handling on the ground and enables carrying of alternative payloads. Vehicle airframe is aerodynamically designed as high-wing monoplane; its configuration includes fuselage and one tail boom that supports vertical and horizontal tail. Chosen design includes nose mounted motor and pulling propeller of fixed pitch for safe starting – release from operator's hand and simpler fitting of electric motor. Since all equipment is mounted inside fuselage gondola, such configuration does not interfere with fields of vision of onboard sensors. Air vehicle is fully adapted for easy handling, quick dismantling and reassembling in field conditions by its operator, without any need for special tools.

Vehicle airframe is made of modern composite materials, with local multi-layer reinforcements at places where loading is concentrated. Its wing is single-spar monocoque design, with multi-layer skin. Fuselage gondola with tail boom cantilever is divided in several sections that determine inner structure which is of sandwich construction, with service ports and reinforcements where required. Tail boom is integrated with vertical tail and contains attachments to fuselage gondola cantilever. Propulsion system consists of electric motor of 300-600 W output power. Air vehicle



wing span if 2.8m, wing area is 0.75m2 , fuselage length is 1.94m, height is 0.47m. Maximum takoff mass is 5 kg, payload mass is 0.9 kg.

HARDER DIGITAL SOVA PROFIL KOMPANIJE

HARDER DIGITAL SOVA COMPANY PROFILE

Preduzeće "Ei Sova" osnovano je 1975. godine kao deo kompanije Ei RC. Zasnovano na tehnologiji preuzetoj od DEP-a (Delpth Electronic Products), preduzeće je specijalizovano za proizvodnju vrhunskih radio cevi, kao i bialkalnih pojačivača slike.

Počev od 1985, na osnovu transfera tehnologije od engleske kompanije EEV (English Electric Valve), "Ei Sova" započinje pun program proizvodnje pojačivača slike II generacije, kako standardnih tipova, tako i tipova pojačivača prilagođenih zahtevu kupca.

Godine 1985. "Ei Sova" prerasta u samostalnu kompaniju, u potpunosti orijentisanu ka tržištu pojačivača slike.

U martu 2008. godine "Ei Sova" prelazi u vlasništvo nemačke kompanije "Harder Digital". Trenutno čini deo grupacije "Harder Digital", pod novim nazivom "Harder Digital Sova".

"Harder Digital Sova" pojačivači slike standardne konfiguracije prevashodno su namenjeni različitim uređajima za noćno osmatranje, koji nalaze svoju primenu u delatnostima vojnih i policijskih oružanih snaga. Od standardnih pojačivača slike dostupni su tipovi I, II, kao i Premium generacije, a u razvoju su i tipovi pojačivača slike III generacije.

Pored toga, "Harder Digital Sova" pruža mogućnost izrade pojačivača slike različitih performansi za posebne namene, posebno izrađenih u skladu sa individualnim zahtevima i potrebama kupca.

Različiti tipovi uređaja za noćno osmatranje kao što su noćni nišan, naočare za noćno osmatranje i višenamenski monokular za noćno osmatranje, dostupni su kao dodatni program podrške kupcima za sistemska rešenja.

Proizvodni pogon "Harder Digital Sova" nalazi se na preko 2.200 m^2 površine i raspolaže namenskom infrastrukturom i jedinstvenom opremom za testiranje i proizvodnju kako standardnih pojačivača slike, tako i posebnih tipova prilagođenih potrebama kupca.

HD1400 Pojačivač slike,
25mm, Inverter Tip MX-9644/UV
HD1400 je 25mm pojačivač slike, inverterski tip II generacije, MX-9644/UV tip.

HD1400 se sastoji od jednog modula koji sadrži mikrokanalnu ploču - pojačavač signala elektrona, kao primarni izvor pojačanja. Cev koristi S20 fotokatodu u proširenoj

The enterprise "EI Sova" was founded, as part of the EI RC Company, in 1975. Based on the technology transferred by DEP (Delpht Electronic Products) "EI Sova" specialized in production of sophisticated radio tubes as well as Bi-alkali Image Intensifiers.

Since 1985, based on the technology transferred from the English company-EEV (English Electric Valve), "EI Sova" has been producing full scale production of Generation II Image intensifiers, standard types, as well as intensifiers tailored to the request of the customer.

In 1989 "EI Sova" developed into an independent company, fully oriented to the Image Intensifier market.

infrared oblasti, aluminizirani fosforni ekran, kao i izvor napajanja. Inkapsulirana je u plastično kućište visoke mehaničke otpornosti, sa odgovarajućim električnim kontaktima.

Izvor napajanja radi u sprezi sa ON/OFF spoljašnjim potenciometrom za podešavanje pojačanja. Sadrži ABC automatsku kontrolu osvetljaja obezbeđujući na taj način konstantni osvetljaj na izlaznom stepenu bez obzira na promenu nivoa osvetljaja. Pored toga, izvor napajanja obezbeđuje BSP zaštitu od bljeska, štiteći pojačivač slike od izlaganja previsokom nivou svetlosti.

HD2100 PREMIUM 18mm,
Inverter Pojačivač slike Tip AN/AVS-6

HD2100 je 18mm inverter II generacije pojačivača slike, tip AN/AVS-6.

HD2100 je pojačivač slike sa visokim pojačanjem i visokom osetljivošću fotokatode, pogodan za pasivne sisteme i naočare za noćno osmatranje

HD2100 se sastoji od izuzetno efikasne S25 extended red fotokatode na ulaznom staklenom sočivu, mikrokanalne ploče kao pojačivača signala elektrona, kao i fosfornog ekrana koji je nanešen na izlazno fiberoptičko sočivo.
HD2100 sadrži visokonaponski izvor napajanja sa ABC automatskom kontrolom osvetljaja, obezbeđujući na taj način konstantni osvetljaj na izlaznom stepenu bez obzira na promenu nivoa osvetljaja. Pored toga, izvor napajanja obezbeđuje BSP zaštitu od bljeska, štiteći pojačivač slike od izlaganja previsokom nivou svetlosti.

In March 2008 “EI Sova” was acquired by the German company - “Harder Digital”. Currently “EI Sova” forms a part of “Harder Digital” group and operates as “Harder Digital Sova”.
The main use of the “Harder Digital Sova” standard configuration Image Intensifiers is for various Night Vision Systems utilized by military and homeland security forces. Standard Image Intensifiers are available as Generation I, Generation II and Premium technologies, while Generation III is currently under development.
In addition, “Harder Digital Sova” is qualified to produce various performance level Image Intensifiers, for particular purposes, specially tailored in accordance with the individual requirements and demands of the customer.
Different types of Night vision equipment as rifle sight, goggles, multi purpose monocular are offered as a customer support program for system solution.
EI Sova production facility covers the area of over 2,200 m2 incorporating appropriate infrastructure and unique equipment for testing and production of standard Image intensifiers and special types adjusted to the customer’s needs.

HD1400 Image Intensifier Assembly,
25mm, Microchannel Inverter
MX-9644/UV type

Description
HD1400 is 25 mm Image intensifier assembly, micro-channel inverter MX-9644/UV type.
HD1400 consists of a single module containing a microchannel electron multiplier as the primary gain mechanism. The assembly employs an S20 photocathode with an extended red response, an aluminized phosphor screen and power supply. The assembly is encapsulated in a hard surface insulating sleeve with electrical contact.

The power supply operates in conjunction with an ON/OFF external gain adjust control circuit. It incorporates (ABC) automatic brightness control providing constant output image brightness regardless of change of light level. The power supply also provides (BSP) bright source protection to protect the tube against exposure to high light levels.

HD2100 je potpuno samostalan tip pojačivača slike smešten u kompaktno kućište.

MPM-14 Višenamenski monokular za noćno osmatranje

Opis

MPM-14 je višenamenski monokular za noćno osmatranje. Namenjen je za nadgledanje, navigaciju, SERE (Survival, Evasion, Resistance, Escape), a može se koristiti i kao nišan za kratki i srednji domet, čime pruža višestruke mogućnosti za različite zahteve pri tom eliminišući potrebu za nošenjem dodatne specijalizovane opreme.

Male težine, kompaktan i dobro balansiran, MPM-14 je pogodan za ručno držanje, ili se pak može staviti na šlem za hands-free operacije, NBC kompatibilan.

MPM-14 koristi visokokvalitetni pojačivač slike II ili III generacije, sa integrisanim izvorom napajanja koji omogućava ABC kontrolu osvetljaja i BSP zaštitu od bljeska, štiteći ga od izlaganja previsokom nivou svetlosti.

Osnovne karakteristike

- Mala težina, kompaktnost, zaštita od vlage
- Pozicioniranje za osmatranje levim i desnim okom
- NBC kompatibilan
- Ugrađen IR iluminator za čitanje mapa
- Može se koristiti i kao noćni nišan
- IR indikator
- Indikator nivoa baterije
- Flip-Up/Flip-Down pozicija sa automatskim isključivanjem

HD2100 PREMIUM 18mm,
Inverter Image Intensifier
Type AN/AVS-6
Description

HD2100 is 18 mm Inverter and represents II generation of image intensifier, type AN/AVS-6.

HD2100 is Image intensifier with high gain and sensitivity of photocathode, suitable for passive systems and night vision goggles.

HD2100 consists of exceptionally efficient S25 extended red photocathode on the input glass lens, micro-channel panel as electron signal intensifier, and phosphorous screen placed on output fiber optic lens.

HD2100 contains high voltage power supply with (ABC) automatic brightness control which provides constant output image brightness regardless of light level change. The power supply also provides (BSP) bright source protection to guard the tube against exposure to high light levels.

HD2100 is completely independent type of Image intensifier placed in the compact housing.

MPM-14 night vision multi purpose monocular

Description

MPM-14 is a single tube night vision multi purpose monocular. It is intended for surveillance, navigation, SERE (Survival, Evasion, Resistance, Escape) or for use as a short to medium range weapon sight, providing increased versatility while eliminating the need to carry multiple types of specialized equipment

Lightweight, ridged and well balanced, MPM-14 can be hand-held or worn on a head-mask for hands-free operation, NBC compatible.

MPM-14 utilizes Generation II or Generation III high performance image intensifier tube with integrated power supply, which provides automatic brightness control (ABC) and bright source protection (BSP) for guarding against exposure to high levels of light.

• Ugrađen senzor za automatsko isključivanje prilikom visokog nivoa osvetljaja
• A-fokalni Clip-On objektiv -x3; x4; x5 (opcionalno)
• Kompatibilan sa Red Dot/Reflex Sight/laserskim daljinomerima

Posebne namene
• Ručno noseće naočare
- Za navigaciju
- Za čitanje mapa
- Za osmatranje
• Montiran na masku/šlem
- Za hands-free rukovanje
- Za navigacija
- NBC kompatibilan
• Montiran na oružje
- Kao nišan za kratki domet
- Kompatibilan sa Red Dot/Reflex Sight/laserskim daljinomerima

NNO M-04
Noćni nišan sa uvećanjem X3
Opis

NNO M-04 je noćni nišan sa uvećanjem X3. Namenjen za kratka i srednja rastojanja, NNO M-04 pruža višestruke mogućnosti za različite zahteve noćnog osmatranja i koristi se za individualnu upotrebu.

Kućište nišana je izrađeno od aluminijumske legure visoke otpornosti, predviđeno da izdrži ekstremne uslove spoljne sredine u svakodnevnoj terenskoj upotrebi.

NNO M-04 koristi visokokvalitetni pojačivač slike II+ generacije, sa integrisanim izvorom napajanja koji omogućava ABC kontrolu osvetljaja i BSP zaštitu od bljeska, štiteći ga od izlaganja previsokom nivou svetlosti.

Noćni nišan NNO M-04 sadrži:
- pasivnu podesivu končanicu sa mogućnošću podešavanja, kao i
- kontrolu ON/OFF
- podešavanje fokusa okulara.

Posebno dizajniran optički sistem NNO M-04 nišana čini ga potpuno kompatibilnim za rad sa svim tipovima laserskih daljinomera.

NVG-7L Naočare za noćno osmatranje
Opis

NVG-7L predstavlja naočare za noćno osmatranje sa jednim pojačivačem slike. Namenjen je za osmatranje, nadgledanje i kopnenu navigaciju pružajući višestruke mogućnosti za različite zahteve, pri tom eliminišući potrebu za nošenjem dodatne specijalizovane opreme.

System Features

• Lightweight, rugged, humidity proof
• Left or Right eye positioning
• NBC compatible
• Build-in IR illuminator for map reading
• Weapon mounted-Rifle scope
• IR operation indicator
• Low battery indicator
• Flip-Up/Flip-Down position with automatic shut down
• Built-in sensor for High Light automatic shut down
• A-focal Clip-On Objective-x3; x4; x5 (Optional)
• Red Dot/Reflex Sight/Laser designators compatible

Mission Dedicated
• Handheld Goggles
-Navigation
-Map Reading
-Observation

• Head Mask/Helmet mounted
-Hands Free operation
-Navigation, Engagement
-NBC compatible
• Weapon mounted
-Short ranges Rifle Scope
-Red Dot/Reflex Sight/Laser designators compatible

NNO M-04 X3 Low Profile Night Vision Weapon Sight
Description

NNO M-04 is X3 low profile night vision weapon sight. It is intended for short to medium range engagements, and provides increased survivability under multiple mission profiles. It is used for individual weapons.

Sight housing is made of high strength aluminum alloy and is designed to survive the typical rugged military use and environment.

NNO M-04 utilizes Generation II+ high performance image intensifier tube with integrated power supply, which provides automatic brightness control (ABC) and bright source protection (BSP) for guarding against exposure to high levels of light.

60 mm M06 LIGHT LONG-RANGE MORTAR FAMILY

- 1200 mm and 1500 mm barrel length
- 650 bar working pressure
- 5.2 km maximum range with 1200 mm barrel
- 5.5 km maximum range with 1500 mm barrel
- two-man portable
- total weigth 25.5 kg/27 kg

YUGOIMPORT-SDPR

Male težine, kompaktan i dobro balansiran, NVG-7L je pogodan za ručno držanje, ili se može staviti na šlem za hands-free operacije. Poseduje posebnu futrolu za nošenje, kao i vrpcu za nošenje naočara oko vrata, čime obezbeđuje maksimalan komfor pri upotrebi.

Sofisticiranim optičkim dizajnom postignuta je fiksirana pozicija sočiva okulara, a time i mogućnost prilagođenja različitim interpupilarnim razmacima.

NVG-7L koristi visokokvalitetni pojačivač slike II ili III generacije, sa integrisanim izvorom napajanja koji omogućava ABC automatsku kontrolu osvetljaja i BSP zaštitu od bljeska, štiteći ga od izlaganja previsokom nivou svetlosti.

Potpuno je kompatibilan sa svim tipovima lasera i laserskih daljinomera..

Osnovne karakteristike

- Mala težina, kompaktnost, zaštita od vlage
- Mogućnost montiranja na šlem
- NBC kompatibilan
- Ugrađen IR iluminator za čitanje mapa
- IR prekidač
- IR indikator
- Indikator nivoa baterije
- Flip-Up/Flip-Down pozicija
- Ne zahteva dodatno podešavanje interpupilarnog razmaka
- Ugrađen senzor za automatsko isključivanje prilikom visokog nivoa osvetljaja
- A-fokalni Clip-On objektiv -x3; x4; x5 (opcionalno)

Posebne namene

- Ručno noseće naočare
- Za navigaciju
- Za čitanje mapa
- Za osmatranje
- Montiran na masku/šlem
- Za hands-free rukovanje
- Za navigaciju
- NBC kompatibilan
- Sa sočivom objektiva za uvećanje x4/x5
- Za kratki i daleki domet osmatranja
- Za kontrolu paljbe

The Weapon Sight incorporates:
- passive adjustable reticule as well as:
- power ON/OFF
- eyepiece focus.

NNO M-04 specially designed optics makes it fully compatible for operation with all types of Laser Target designators.

PVS-7 night vision goggle

Description

The PVS-7 is a single tube night vision goggle. It is intended for observation, surveillance and land navigation providing increased versatility eliminating the need to carry multiple types of specialized equipment.

Lightweight, ridged and well balanced, PVS-7 can be handheld or worn on a head-mask for hands-free operation. In addition to a flexible carrying case, a neck strip is provided for operator comfort.

Sophisticated optical design provides fixed position of eyepiece lens, and consequently allows adjustment to different inter pupil spacing.

PVS-7 utilizes High Performance image intensifier tube with an integrated power supply, which provides automatic brightness control (ABC) and bright source protection (BSP) for garding against exposure to high levels of light.

It is fully compatible with all types of laser and laser designators.

System Features

- Lightweight, Rugged, Humidity - proof
- Possibility of mounting on helmet
- NBC compatible
- Build-in IR illuminator for map reading
- Momentary IR switch
- IR operation indicator
- Low battery indicator
- Flip-Up/Flip-Down position
- Additional adjustment of inter pupil spacing not required
- Built-in sensor for High Light automatic shut down
- A-focal Clip-On Objective-x3; x4; x5 (Optional)

Mission Dedicated

- Handheld Goggles

-Navigation
-Map Reading
-Observation

- Face Mask/Helmet mounted

-Hands Free operation
-Navigation, Engagement
-NBC compatible

- x4/x5 Magnification Objective Lens

-Short to Long Range Observation
-Fire Control

Zastava oružje AD Istorija duga 155 godina

Piše
Marketing Zastava oružje AD

Fabrika »Zastava oružje« 27. oktobra 2008. godine obeležila je 155 godina rada i postojanja i fabričku slavu »Sveta Petka«.

Proslava je počela performansom »Karaula« u kome su učestvovali zaposleni u Zastava oružju i učenici Politehničke škole. Zamišljen kao šetnja kroz istoriju, performans je realizovan po ideji Biroa za marketing, uz svesrdnu pomoć glumca Knjaževsko srpskog teatra, Mirka Babića i novinara Zorana Mišića.

Svečana akademija održana je u fabričkom muzeju "Stara livnica", uz prisustvo brojnih gostiju, predstavnika Države Srbije, poslovnih partnera, sportskih velikana, predstavnika filmske industrije, lokalne samouprave.

Zastava Arms AD 155 years of history

By
Marketing Department of Zastava Arms AD

The 155th anniversary of Zastava Arms Company was celebrated on 27th October 2008 under the auspices of their Patron Saint, St. Petka (or Greek Paraskevi).

The celebration started with the performance »Border Post« given by the employees of Zastava Arms and students of the Polytechnic College. Conceived as a historical chronicle, the performance was staged in the organization of the Marketing Department, and with wholehearted support of Mr. Mirko Babic, an actor of the Serbian Theatre of Knjazevac, and Mr. Zoran Misic, a journalist.

The formal ceremony was held in the factory museum "Old foundry", in the presence of numerous guests, repre-

Povodom 155. godišnjice fabrike dodeljena su interna i eksterna priznanja fabrike Zastava oružje. Za izuzetan lični doprinos i iskazane rezultate u radu, Medalje topolivca, najviše priznanje fabrike, direktor Rade Gromović dodelio je Vukašinu Filipoviću, koji je na žalost u međuvremenu preminuo, Radosavi Bubanji, Milošu Đokoviću, Stevanu Sedlareviću i Tomislavu Ristiću, posthumno. Trofejnim nožem i zahvalnicama nagrađeno je 38 zaposlenih.

Povodom obeležavanja jubileja Zastava oružja, a za izvanrednu poslovnu saradnju, negovanje uzajamnih poslovnih odnosa i pun doprinos razvoju društva, eksterna priznanja, Zlatne plakete, dobile su sledeće institucije: Ministarstvo odbrane Republike Srbije - Sektor za materijalne resurse, Generalštab Vojske Srbije - Uprava za planiranje i razvoj J-5, Ministarstvo ekonomije i regionalnog razvoja RS, Ministarstvo unutrašnjih poslova RS i Banka Intesa, Beograd. Dodeljeno je i deset plaketa za uspešnu poslovnu saradnju - gradu Kragujevcu, preduzeću Jugoimport-SDPR, Tehničko remontnom zavodu - Kragujevac, Željezari Nikšić... Regionalna privredna komora Kragujevca dodelila je plaketu Zastava oružju.

Obraćajući se gostima, direktor Gromović je rekao:

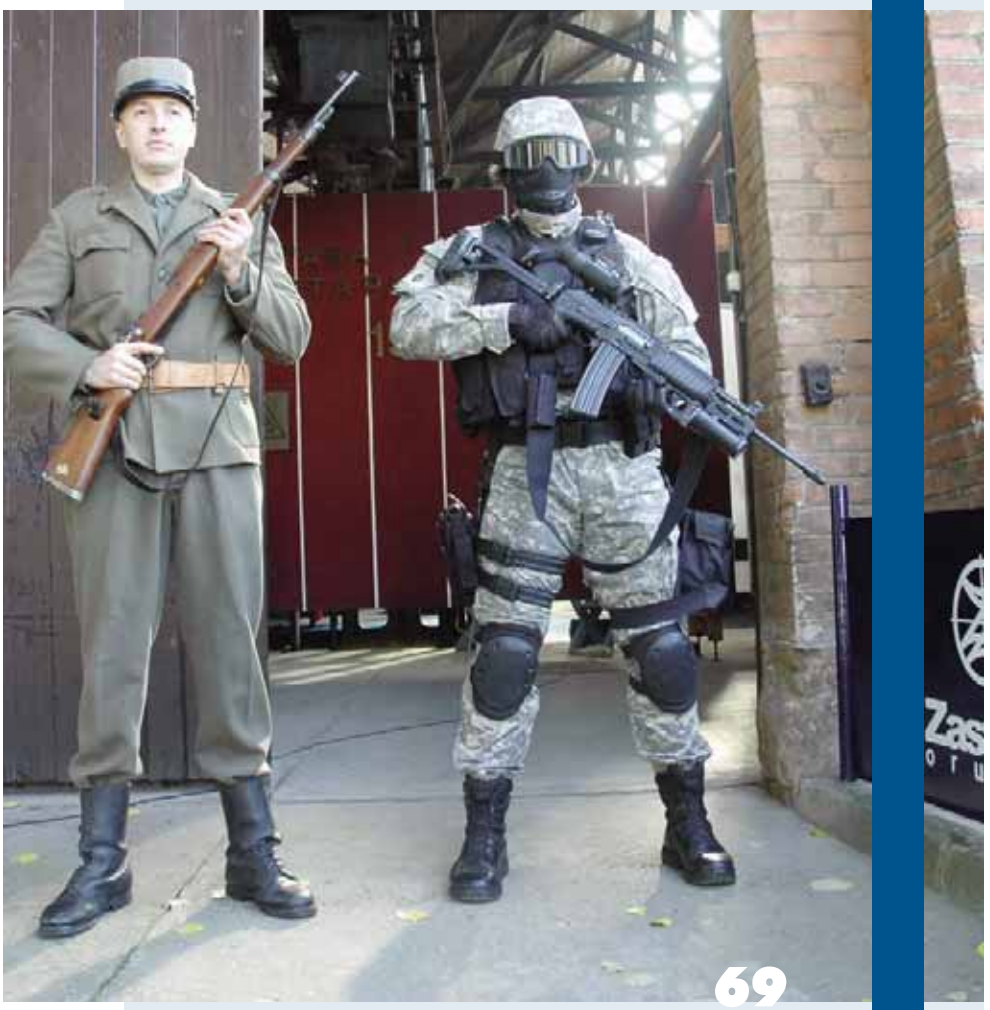
»...Zastava oružje u svojoj dugoj istoriji uvek je negovala kosmopolitski duh i društvenu odgovornost marketinga. Ove godine održan je 12. kup u streljaštvu za pionire „KUP ZASTAVA ORUŽJE“, odnosno kadete i kadetkinje. Fabrika neguje svoj otvoreni duh kroz saradnju sa brojnim institucijama kulturnog stvaralaštva, poput Zavoda za zaštitu spomenika kulture, brojnih pozorišnih, filmskih kuća, sportskih organizacija, lovačkih udruženja...

Tradicionalno, Zastava oružje nastupa na većini domaćih sajamskih manifestacija lovačkog i sportskog oružja, kao i najvažnijim svetskim sajmovima LSO poput sajmova Shot Show – USA i IWA u Nemačkoj. U saradnji sa Jugoimport SDPR-om Zastavino oružje se prezentira na međunarodnim sajmovima u Brazilu, Singapuru, Maleziji, Jordanu, i drugim zemljama ...

sentatives of the Serbian Government, business partners, sports celebrities, representatives of the film industry and local government.

The anniversary was an opportunity for awarding internal and external recognitions of Zastava Arms factory. The foundry medal, the greatest appreciation offered by the factory, was awarded by its director, Mr. Rade Gromovic, to Vukasin Filipovic posthumously for his exceptional contribution and accomplishments, to Radosava Bubanja, Milos Djokovic, Stevan Sedlarevic and to Tomislav Ristic posthumously. Trophy knives and acknowledgments were awarded to 38 employees.

On the same occasion, a number of external recognitions, golden plaques for an exceptional business cooperation, for promoting good relationship and for full contribution to the development of the society were presented to the following institutions: Ministry of Defence of the Republic of Serbia – Department for material resources, General Headquarters of the Military of Serbia –Planning and Development Directorate (J-5), Ministry of Economy and Regional Development of the Republic of Serbia, Ministry of the Interior of the Republic of Serbia and Bank Intesa, Beograd. Ten more plaques for a successful business cooperation were awarded to the town of Kragujevac, to Yugoimport-SDPR company, to the Technical-Overhaul Depot – Kragujevac,to Iron Wors of Niksic…



Danas, Zastava oružje prati trendove razvoja NVO i u ponudi tržištu akcenat je na novim artiklima: Automatska puška M21 koja je nedavno dobila razrešnicu za serijsku proizvodnju, Bacač granata automatski 30 mm, Dalekometna puška M93, Puška snajperska M91, Bacač granata podcevni 40 mm, Pešadijski mitraljez M02 12,7 mm „Kojot".

Zastava oružje će 2008. godinu završiti sa obimom prodaje uvećanim 80% u odnosu na 2007. godinu, odnosno na nivou od 25 mil. USD. Izvoz i dalje čini 95% našeg plasmana.

Podrška koju dobijamo od Države nas čini jačim, snažnijim ali i odgovornijim da sve obaveze i planirane aktivnosti u potpunosti sprovodimo. Pred nama je vreme izazova, pre svega tržišnih. 155 godina iza nas su obavezujuće za sve zaposlene u Zastava oružju da nastavimo putem naših prethodnika, gradeći i stvarajući bolje uslove rada za sve zaposlene. To ćemo postići samo kvalitetnim, efikasnim radom, poštujući preuzete obaveze prema partnerima i nadasve izvrsnim kvalitetom naših proizvoda.«

Ministar odbrane, Dragan Šutanovac, na Svečanoj akademiji je rekao:

»Ministartsvo odbrane će biti dobar partner, dobar kupac i dobar zastupnik fabrike Zastava oružje u Vladi Srbije. Izgradnja autoputa Kragujevac-Batočina i izgradnja civilnog i vojnog aerodroma u Lađevcima doprineće da proizvodi kragujevačke fabrike budu bliže kupcu.«

Povodom jubileja štampano je drugo, prošireno izdanje monografije »Kolevka srpske industrije«.

Razvojni projekti Zastava oružja za 2009. godinu

Fokusiranje

Pozicioniranost lovačkog i sportskog programa Zastava oružja

U razvoju i plasiranju lovačkog i sportskog oružja fabrika Zastava oružje je zahvaljujući kvalitetu, baziranom na tradiciji, uvek imala dobru pozicioniranost na svetskom tržištu. Devedesetih godina fabrika Zastava oružje izgubila je stečene pozicije na američkom tržištu, iz poznatih razloga – primena restriktivnih mera prema

The Regional Chamber of Commerce of Kragujevac awarded a plaque to Zastava Arms.

Addressing the audience, director Gromovic said:

»...In its long history Zastava Arms company has always cultivated cosmopolitan mentality and social responsibility in its marketing activities. This year, the 12th shooting competition for juniors and male and female cadets was held under the name of ZASTAVA ARMS CUP. The factory fosters its open-mindedness by cooperating with many culture-related institutions such as the Institute for the protection of Cultural Monuments of Serbia, a large number of theatres, film companies, sports organizations, hunting associations...

Traditionally, Zastava Arms participates in the majority of the local exhibition events in the field of hunting and sporting arms, but it is also present at the major world events in this field such as Shot Show – USA and IWA, Germany. In cooperation with Yugoimport-SDPR, products of Zastava Arms are shown at the international events in Brazil, Singapore, Malaysia, Jordan and some other countries...

Today, Zastava Arms follows the development trends in armaments and defence equipment; in its offer to the market great emphasis is placed on new articles: the M21 Automatic Rifle which has recently been approved for series production, 30 mm Automatic Grenade Launcher, M93 Long Range Rifle, M91 Sniper Rifle, 40 mm Under Barrel Grenade Launcher, 12.7 mm M02 Coyote Infantry Machinegun.

Zastava Arms is going to end the year 2008 with sales volume increased by 80% compared to that of 2007, i.e. at the level of 25 million USD. Export deals still account for 95% of our sales.

The support we enjoy from the Government makes us stronger, more vigorous but also more determined to fully implement all our obligations and planned activities. We have challenging time ahead of us, primarily concerning the market. Our 155-year background is binding upon all the people working for Zastava Arms to carry on the efforts made by our predecessors, building and creating better working conditions for all. The only way to achieve this is high quality work, efficient operation, and honouring the commitments taken towards our partners, but above all it should be an excellent quality of our products «

The Minister of defence, Mr. Dragan Šutanovac, addressing the gathering at the ceremony said:

»The Ministry of defence will be a good partner, a good customer and a good representative of Zastava Arms factory before the Government of the Republic of Serbia. Construction of the highway section Kragujevac-Batočina and building of a commercial and military airport in Lađevci will help the products of Kragujevac factory to be closer to their customers.«

In honour of the anniversary, the second, enlarged edition of the monograph »The Cradle of Serbian History« has been published.

n a š o j državi. Okolnosti su se promenile i potpisivanjem Memoranduma sa kompanijom Remington, 2005. godine i plasiranjem proizvoda preko njihovog ovlašćenog distributera, kompanije US Sporting Goods, Zastava oružje vratila se na američko tržište. Analizom saradnje sa američkim partnerima stručnjaci Zastava oružja evaluirali su potrebe tržišta i ustanovili tendencije razvoja lovačkog i sportskog programa, pre svega lovačkih karabina.

Osnovna ideja u projektovanju i razvoju proizvoda Zastava oružja je razviti lovački karabin više klase. Nedavno na mesto rukovodioca ove celine postavljen je inventivni konstruktor Aleksandar Mladenović. Po njegovim rečima: "Razvijanjem novog karabina, po svim karakteristikama, treba da se nađemo u grupi proizvođača koji imaju visok ugled i visoku cenu proizvoda. Mi smo i do sada imali kvalitetan proizvod, ali je on bio u srednjoj klasi. Cilj nam je da naš novi karabin uđe u klasu vodećih svetskih brendova u toj oblasti."

U razvoju Zastava oružja je već napravljen prototip lovačkog karabina visoke klase, model LK M808. Višedecenijsko iskustvo u primeni Mauzer sistema primenjeno je i na ovom modelu, ali je on bitno redizajniran i prilagođen ergonomskim zahtevima korisnika. "Picatinny" profilom na sanduku karabina M808, Zastava oružje uvažava zahteve kako američkog, tako i evropskog tržišta pri ugradnji najrazličitijih optičkih sprava i uređaja.

U 2008. godini u Zastava oružju osvojena je i tehnologija za izradu karabina od nerđajućeg čelika, što je sjajna podloga za plasiranje novog modela ovog karabina u idućoj godini. "Stainless steel" karabini su po svojim karakteristikama karabini više klase.

U saradnji sa takmičarskim sportskim društvima za dalekometno pucanje, nastavljen je razvoj i izvršen redizajn karabina LK M07 Match. On je predstavljen na sajmu IWA 2008 u Nirnbergu i izazvao je veliko interesovanje. Očekujemo da će u 2009. godini početi serijska proizvodnja ovog karabina.

Familijom pištolja EZ, Zastava oružje napravila je ozbiljan iskorak na američkom tržištu. Pokazalo se da su ovi pištolji po funkcionalnim i ergonomskim karakteristikama jako dobro pozicionirani. Marketinška kampanja našeg američkog partnera, kompanije EEA (European American Armory), imala je dobar odjek u Americi. Što se tiče razvojnih planova, familija pištolja EZ biće dopunjena kompakt varijantama, čime će se lepeza tih proizvoda proširiti na nivo koji potpuno odgovara zahtevima tržišta.

Development projects of Zastava Arms for 2009

Focus

Positioning of hunting and sporting program of Zastava Arms

In the development and marketing of hunting and sporting arms, Zastava Arms has always been well positioned on the world market thanks to its traditional quality. In the 90s of the last century the factory lost its position on the American market for generally known reasons – restrictive measures imposed on our country. The circumstances changed in 2005 when a Memorandum was signed with Remington Company and sales arrangements were made with their accredited distributor, US Sporting Goods Company. Zastava Arms was back on the American market. Its experts analyzed cooperation with American partners and assessed market requirements in order to set development trends of hunting and sporting programs, first of all hunting carbines.

The basic idea in designing and development of Zastava Arms products has been to develop a higher class carbine. An inventive designer, Mr. Aleksandar Mladenovic, has been recently appointed head of this Department. In his words: "The development of our new carbine with all its characteristics should earn us a place among those manufacturers that are known for their reputation and high prices. We have already had a good product, but it was rated as a medium class product. Our objective is to confer to our carbine the class of the leading world brands in this field."

A prototype of a high class hunting carbine, model LK M808 has already been made within Zastava Arms development programs. Decades of experience in the use of Mauzer system have been applied to this model, but it has been substantially redesigned and tailored to suit the user's ergonomic requirements. By using a "Picatinny" profile on the M808 carbine receiver, Zastava Arms has acknowledge requirements of both American and European market as to integration of different optical sighting devices and equipment.

In 2008, Zastava Arms has also mastered the technology of stainless steel carbine, as an excellent basis for marketing this product in the next year. By their characteristics, the "Stainless steel" carbines rank as high class carbines.

In cooperation with competitive sports societies for long range shooting, the development of LK M07 Match carbine resulted in a redesign of this arm. It was first displayed at the IWA 2008 in Nuremberg where it aroused great interest. It is expected that the carbine will enter in series production in 2009.

With its family of EZ pistols, Zastava Arms has made a serious advance on the American market. These pistols have proven to be very well positioned thanks to their functional and ergonomic characteristics. A marketing campaign of our American partner, EEA company (European American Armory), met with positive response in the USA. As for the development plans, the family of EZ pistols will be completed with compact versions, thus extending the array of these products to a level that will fully conform to market requirements.

Opremanje Vojske Srbije

U 2008. godini počelo je opremanje Vojske Srbije automatskom puškom M21, u kal. 5,56 mm. Trenutno se razvijaju varijante automatske puške M21 koje će izaći u susret zahtevima specijalnih jedinica i jedinica za antiterorističke dejstva. Činjenica da je automatska puška M21 usvojena u naoružanje naše Vojske značajno unapređuje poziciju Zastava oružja pri plasiranju ovog oružja inostranim kupcima.

Opremanje mirovnih misija Ujedinjenih nacija

Krizna žarišta u svetu su nažalost, u ekspanziji. Potrebe Mirovnih misija Ujedinjenih nacija u 2008. godini diktirale su opremanje jedinica na terenu širom sveta određenim sredstvima. Jedno od tih sredstava je i mitraljez 12,7 mm M87 na adaptiranom postolju za vozilo Hummer. Zastava oružje brzo je odgovorila zahtevima Mirovnih misija UN.

Mitraljez 12,7 mm M 07 HMMWV (u daljem tekstu M07), baziran je na mitraljezu 12,7 mm M87 NSV.

Mitraljez M07 je namenjen za neutralisanje i uništavanje žive sile, motornih i lako-oklopljenih vozila (pokretnih i nepokretnih), na daljinama do 2000 m.

Komplet mitraljeza M07 čini: komplet mitraljeza 12,7 mm M87 i komplet kolevke mitraljeza 12,7 mm M07.

Tehnički podaci

masa mitraljeza 12,7 mm M07	44 kg
masa municijske kutije sa 50 metaka	11 kg
dužina	maks 1740 mm
širina bez m.k. i hvatača redenika	maks 230 mm
širina sa m.k. i hvatačem redenika	maks 710 mm
visina	maks 390 mm
daljina efektivnog dejstva	1500 m do 2000 m
početna brzina	820 m/s do 860 m/s
brzina gađanja	min 700 met /min
način hranjenja	redenik u municijskoj kutiji
municija	metak 12,7 mm sa zrnom B – 32, BZT - 44

Planovi Zastava oružja za 2009. godinu

Modernizacija i adaptacija postojećih borbenih sredstava, kao trend u svetu, diktira aktivnosti na razvoju sledećih sredstava:

Laki puškomitraljez 5,56mm M21

Daljinski upravljane lake modularne borbene stanice (razvoj sredstava PVO i njihovih montaža na razne platforme – vozila, brodovi, čamci...)

Podvesni kontejneri za mitraljez M87 12,7mm za vazduhoplovna sredstva

Nepokriveni segment civilnog tržišta u proizvodnji oružja vojnog izgleda („military styling“) zahteva redizajniranje postojećeg automatskog oružja u poluautomatsko oružje u skladu sa zakonskim regulativama inostranih tržišta.

Strateško opredeljenje fabrike Zastava oružje AD je da u narednom periodu stavi veći akcenat na projektovanje i razvoj proizvoda. U surovoj utakmici, uz globalnu ekonomsku krizu, neophodno je brzo praćenje svih trendova i reagovanje na zahteve svetskog tržišta.

Arming the Military of Serbia

In 2008, started introduction of the 5.56-millimetre M21 automatic rifle in the Military of Serbia. The development of M21 rifles is under way; they should satisfy the requirements of special units and units for antiterrorist operations. The fact that the M21 automatic rifle has been introduced in our armed forces significantly strengthens the position of Zastava Arms in their efforts to sell this arm to foreign customers.

Arming the United Nations peace-keeping missions

Regretfully, the crisis hot spots in the world are expanding. The needs of the UN peace-keeping missions have dictated equipping of units deployed throughout the world with some specific items. One of them was the 12.7-millimetre M87 machinegun placed on an adapted platform of the Hummer vehicle. Zastava Arms were prompt in answering the requirements of the UN piece-keeping forces.

The 12.7-millimetre M07 HMMWV machinegun (hereinafter M07), is based on the 12.7-millimetre M87 NSV machinegun.

The M07 machinegun is intended for neutralizing and annihilation of live force, motorized and light armour vehicles (on the move and stationary), at ranges up to 2000 m.

A set of M07 machinegun consists of: the 12.7-millimetre M87 machinegun set and the 12.7-millimetre M07 machinegun cradle set.

Technical data

Mass (weight) of 12.7 mm M07 machinegun	44 kg
Mass of ammunition box with 50 rds	11 kg
Length	max 1740 mm
Width without ammo box and link belt catch	max 230 mm
Width with ammo box and link belt catch	max 710 mm
Height	max 390 mm
Effective range	1500 m to 2000 m
Muzzle velocity	820 m/s to 860 m/s
Rate of fire	min 700 rds /min
Feeding method	link belt in ammunition box
Ammunition	2.7 mm round with bullet B – 32, BZT - 44

Plans of Zastava Arms for 2009

Upgrading and adapting of the existing combat means, as a prevailing world trend, dictate the development activities of the following items:

5.56-millimetre M21 light machinegun

Remotely controlled light modular combat stations (development of AD equipment and their installation onto various platforms – vehicles, ships, boats...)

Pods for 12.7-millimetre M87 machine gun for airborne use

The segment of the civilian market that has not been covered is the production of arms with military styling which requires redesigning of the existing automatic weapons into semi-automatic weapons in accordance with legal regulations of foreign markets.Strategic orientation of Zastava Arms AD Company is to place greater emphasis on products design and development. In the circumstances of harsh competition, intensified by a global economic crisis, it is of vital importance to be able to closely follow the trends and react to the requirements of the world market.

Veliki jubilej „Prvog partizana“

Great anniversary of Prvi Partizan

Piše
Mihajlo Topalović

By
Mihajlo Topalović

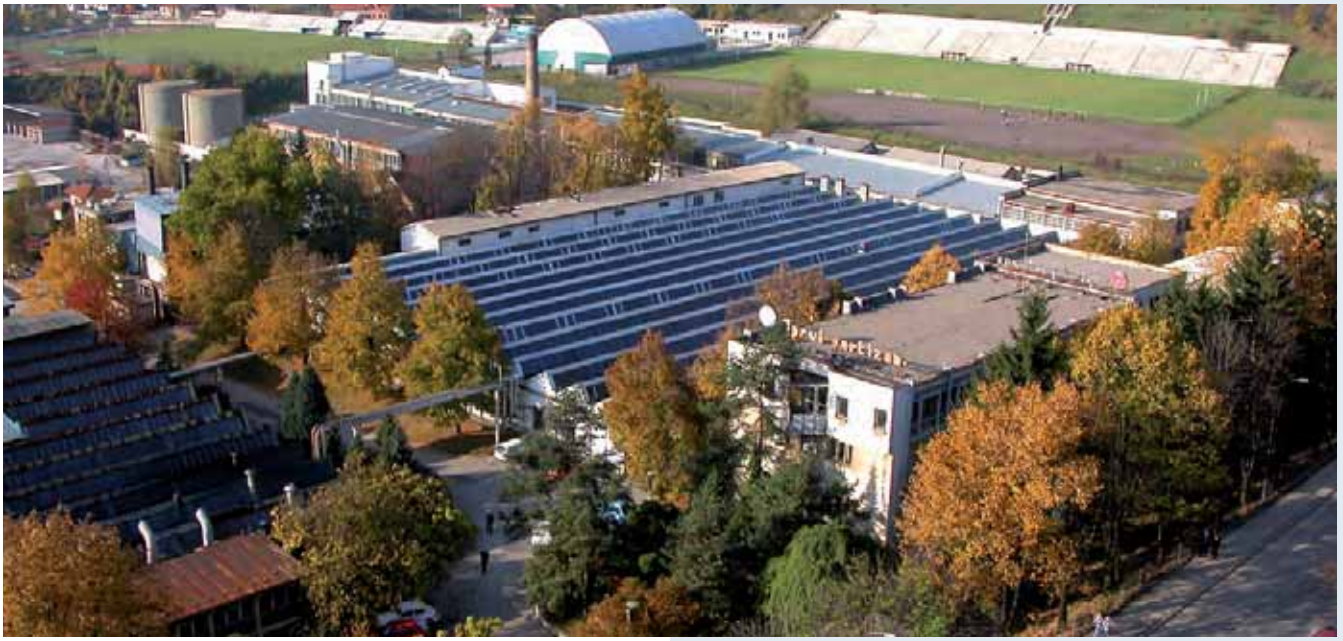
U godini u kojoj nekoliko preduzeća Odbrambene industrije Srbije i institucija Vojske Srbije slave svoje velike jubileje, jedan od najznačajnijih jubileja proslavio je naš jedini proizvođač streljačke municije „Prvi partizan“. Ova firma iz Užica osnovana je davne 1928. godine kao Fabrika oružja i municije Užice (FOMU).

Mnogobrojni gosti iz zemlje i inostranstva koji su prisustvovali proslavi jubileja održanoj 20. novembra bili su jednodušni u oceni da je „Prvi partizan“ na izvanredan način obeležio 80 godina postojanja. Među gostima su bili ministar odbrane gospodin Dragan Šutanovac, ministar trgovine i turizma Republike Srpske gospodin Predrag Gluhaković, načelnik Uprave za odbrambene tehnologije general Danko Jovanović, ambasadorka Kraljevine Belgije u Srbiji njena ekselencija Denise de Hauwere, gradonačelnik Užica gospodin Jovan Marković, direktori i predstavnici fabrika Odbrambene industrije Srbije, Yugoimport-SDPR, najznačajnijih dobavljača, kupaca, institucija, banaka i poslovnih partnera iz Srbije, Crne Gore, Bosne i Hercegovine, Makedonije, Belgije, SAD, Nemačke, Engleske, Francuske, Švajcarske i Bugarske.

Program proslave započeo je okupljanjem gostiju koji su dočekani u prostorijama fabrike. Nakon toga, usledio je obilazak proizvodnih pogona. U Alatnici, pored prigodne izložbe

In the year when several companies of the Serbian defence industry and institutions of the Military of Serbia are celebrating their anniversaries, one of the most important jubilees was marked by our sole manufacturer of small arms ammunition, Prvi Partizan. The Company having its place of business in Uzice was founded back in 1928 as a Weapons and Ammunition Factory of Uzice.

Many guests from the country and abroad who attended the celebration on 20th November were unanimous in their opinion that Prvi Partizan marked 80 years of its existence in an exceptional way. Many distinguished guests were present: Mr. Dragan Sutanovac, Minister of Defence of the Republic of Serbia, Mr. Predrag Gluhakovic, Minister of Trade and Tourism of the Republic of Srpska, General. Danko Jovanovic, Head of Defence Technologies Department, Her Excellency Denise de Hauwere, ambassador of the Kingdom of Belgium to Serbia, Mr. Jovan Markovic, mayor of Uzice, directors and representatives of Serbian defence industry, Yugoimport-SDPR, major subsuppliers, customers, institutions, banks and business partners from Serbia, Montenegro, Bosnia and Herzegovina, Macedonia, Belgium, USA, Germany, France, England, France, Switzerland and Bulgaria.



koja je prikazala mogućnosti kojima raspolaže ovaj pogon, gostima su prikazane i najsavremenije CNC mašine koje su ove godine nabavljene iz Švajcarske. Zahvaljujući ovim mašinama kapacitet i kvalitet izrade alata za proizvodnju municije podignut je na značajno viši nivo. U nabavku ovih mašina investirano je preko milion evra. Takođe, prikazane su i mašine za proizvodnju municije koje se nalaze u proizvodnom programu PPU.

Najznačajniji trenutak prilikom obilaska fabrike bio je puštanje u rad novog pogona koji je otvoren kao rezultat dugogodišnje saradnje sa partnerom FN Herstal iz Belgije. Cilj ovog zajedničkog projekta je da se obezbedi trajna uposlenost jednog dela kapaciteta fabrike. U prisustvu generala Danka Jovanovića i predstavnika firme FN Herstal, vrpcu je presekla ambasadorka Belgije gospođa Denise de Hauwere. Ukupna vrednost ove investicije, u kojoj veliko učešće ima partner iz Belgije, je milion evra. Gosti su zatim obišli pogone za proizvodnju municije, u kojima su mogli da vide u radu najnoviju opremu nabavljenu iz Slovenije, ali i više novih mašina napravljenih u PPU.

Program je nastavljen svečanom akademijom u Narodnom pozorištu. Ovom prilikom generalni direktor PPU gospodin Dobrosav Andrić predao je preko 20 zahvalnica i prigodnih poklona partnerima „Prvog partizana“. Nakon govora koji je održao gospodin Andrić, posebne čestitke, pohvale za dosadašnji rad i lepe želje za budućnost domaćinu je izrazio ministar Šutanovac. Program je završen svečanom večerom, tokom koje su gosti u opuštenoj atmosferi iskazali poštovanje prema domaćinu i želju da još dugo godina rade sa „Prvim partizanom“. Svojim poslovanjem u prethodnoj deceniji „Prvi partizan“ im je pružio najbolji mogući argument za ovakvo razmišljanje.

The celebration started with gathering at the factory premises and continued with touring the production facilities. In the tool shop, in addition to an exhibition showing the capabilities of this plant, the guests were familiarized with the latest generation CNC machines purchased this year from Switzerland. Thanks to these machines, the capacity and quality of tool manufacturing for the needs of ammunition production has been raised to a significantly higher level. More than one million euros have been invested in the procurement of these machines. The presentation also included machines for ammunition production available in the production program of Prvi Partizan.

The central event was the commissioning of a new plant opened as a result of a long term cooperation with FN Herstal, a partner from Belgium. The objective of this joint project is to provide permanent work load for a part of the capacities. In the presence of general Danko Jovanović and the representative of FN Herstal Company, Mrs. Denise de Hauwere, ambassador of Belgium to Serbia, cut the ribbon. The total value of this investment, in which the partner from Belgium has an important share, is one million euros. After that, the guests visited the ammunition production plants and were able to see in operation the newest equipment purchased from Slovenia, but also several new machines made in PPU.

The celebration continued with a program at the National Theatre. On that occasion, Mr. Dobrosav Andrić, director general of PPU, presented more than 20 appreciations and gifts to PPU partners. After the speech delivered by Mr. Dobrosav Andrić, special congratulations, commendations for their efforts made so far and best wishes for the future were addressed to the host by minister Šutanovac. The program ended with a formal dinner. In a relaxed atmosphere, the guests expressed their appreciation of the host and their wish to continue cooperation with Prvi Partizan in the years to come. With its business operations materialized in the previous decade, Prvi Partizan gave them the best possible motivation to do so.

The present moment

In addition to what they were in a position to see while touring the production plants, the guests were acquainted with the current situation of Prvi Partizan and the place it occupies among the world manufacturers, and were informed of the important events and successes achieved this year.

One of the important episodes in the business operation of Prvi Partizan in the current year coincided with the week of anniversary. Activities on recertification of the quality management system as per the requirements of ISO 9001: 2000 standards have just been completed. Granting of a relevant certificate by a German-American certification body DQS is due in December. It should be remembered that Prvi Partizan was the first defence industry company to receive QMS certification in 1998 already.

In the course of this year, Prvi Partizan has successfully and without much upheaval completed the second stage of the social program. The number of permanently employed has been reduced by half compared to the period of 15 years ago. Yet, the factory has retained its human resources for the most part and is expecting record production.

The current year has been marked by different activities

Sadašnji trenutak

Pored svega onoga što su bili u prilici da vide u proizvodnim pogonima, gosti su tokom posete mogli da se upoznaju sa sadašnjim trenutkom „Prvog partizana“, sa pozicijom koju zauzima među svetskim proizvođačima, sa važnim događajima i uspesima postignutim tokom ove godine.

Jedan od značajnih događaja u poslovanju „Prvog partizana“ ove godine desio se upravo u nedelji kada fabrika slavi jubilej. Uspešno su završene sve aktivnosti na resertifikaciji sistema menadžmenta kvalitetom prema zahtevima standarda ISO 9001: 2000. Uručenje sertifikata od strane nemačko-američkog sertifikacionog tela DQS uslediće tokom meseca decembra. Treba podsetiti da je „Prvi partizan“ bio prva firma namenske industrije Jugoslavije koja je sertifikovala sistem kvaliteta još 1998. godine.

Tokom ove godine u „Prvom partizanu“ je sprovedena druga faza socijalnog programa uspešno i bez velikih lomova. Broj stalno zaposlenih radnika smanjen je na polovinu u odnosu na period od pre 15 godina. I pored toga, fabrika je najvećim delom očuvala kadrovski potencijal i ove godine se očekuje rekordna proizvodnja u istoriji fabrike.

Tokom godine odvijale su se aktivnosti na realizaciji nekoliko značajnih projekata koji treba da obezbede trajnu uposlenost fabrike i u budućnosti. Pored modernizacije proizvodnje nabavkom nove opreme, najznačajniji su projekat osvajanja proizvodnje traserne municije, projekat osvajanja proizvodnje municije kalibra 12,7 mm i projekat osvajanja proizvodnje novog kalibra u saradnji sa stranim partnerom. Završetak ovih projekata planiran je u narednoj godini.

in the implementation of several projects supposed to provide permanent work to the factory in the forthcoming period. Topical issues are: production upgrade by acquisition of new equipment; mastering the production of tracer ammunition in calibre 12.7 mm; and mastering the production of a new calibre in cooperation with a foreign partner. Completion of these projects has been planned for the next year.

Prvi Partizan factory earns a living from exports. For years, 95% of its production has been sold outside the country. Its positioning on the world market of small arms, sporting and hunting ammunition has attained a higher level then before the sanctions. This particularly refers to exports of ammunition on the markets of the USA and Western Europe. Factory management has been receiving acknowledgments from the world for the quality of ammunition they produce and for their professional attitude in all segments of business dealings. Prvi Partizan may rightfully expect to continue its expansion on the world market.

Production of defence ammunition

The core element of PPU production program in the field of defence ammunition are standard NATO calibres: 5.56 x 45 mm, 7.62 x 51 mm and 9 x 19 mm. The factory has been producing all three calibres for many years and important quantities have been sold all over the world. After it was discontinued during the sanctions, the export-oriented production has been given a new impetus and owing to the production and sale of these calibres, Prvi Partizan is planning and stands good chances to achieve record production.

Although it has been producing these calibres for many years, Prvi Partizan had to make certain changes in order to

»Prvi partizan« je fabrika koja danas živi od izvoza, a to znači da već godinama preko 95% svoje proizvodnje prodaje van zemlje. Pozicije fabrike na svetskom tržištu streljačke, sportske i lovačke municije podignute su na viši nivo od onoga pre sankcija, što se posebno odnosi na izvoz municije na tržište USA i Zapadne Evrope. Rukovodstvo fabrike dobija pohvale iz celog sveta za kvalitet municije i profesionalni odnos kada su u pitanju svi segmenti poslovanja i zato s punim pravom može da se očekuje da narednih godina »Prvi partizan« nastavi sa ekspanzijom na svetskom tržištu.

Proizvodnja vojne municije

Osnovu proizvodnog programa "Prvog partizana", kad je u pitanju vojna municija, danas predstavljaju standardni NATO kalibri: 5,56 x 45 mm, 7,62 x 51 mm i 9 x 19 mm. Sva tri kalibra nalaze se već dugi niz godina u proizvodnom programu fabrike i značajne količine prodate su širom sveta. Nakon zastoja tokom sankcija proizvodnja za potrebe izvoza se ponovo zahuktala i dobrim delom zahvaljujući proizvodnji i prodaji ovih kalibara „Prvi partizan" je planirao i na dobrom putu je da ove godine ostvari rekordnu proizvodnju u istoriji fabrike.

Iako ove kalibre proizvodi odavno, „Prvi partizan" je morao da izvrši određene promene da bi se prilagodio zahtevima tržišta i ispunio neophodne uslove za isporuku municije po NATO standardima, što je jedan od strateških ciljeva fabrike. Ove promene obuhvatile su sledeće:

1. Sistem ispitivanja usklađen je sa važećim NATO specifikacijama.

adapt to the requirements of the market and fulfil necessary conditions for deliveries complying with NATO standards, which is one of the strategic objectives of the factory. These changes comprise:

1. Testing system harmonized with the governing NATO specifications.

To achieve this, it was necessary to purchase new test equipment, including necessary instruments to measure bullet velocity, pressure of powder gases by piezoelectric method and firing time, as well as new test barrels.

2. New types of ammunition have been introduced in production.

Besides service and blank ammunition, PPU is now producing tracing, sniper and silenced ammunition in NATO calibres.

3. New packing variants have been introduced.

Besides certain modifications in the conventional methods - packing in wooden crates, new methods of ammunition packing into link belts, plastic bags and metal boxes M2A1 have been introduced.

In compliance with the initiated transformation of the Military of Serbia, Prvi Partizan already has in production, develops or modifies all the equipment necessary to satisfy the needs of our armed forces. The development of the sniper ammunition in calibre 12.7 x 108 mm was completed in November, and PPU is producing another variant of this ammunition in calibre 12.7 x 99 m.

In the production program of our factory there are also other calibres used for the needs of the armed forces, police and security forces:

Za ovo je bilo neophodno nabaviti novu opremu za ispitivanje, uključujući instrumente za merenje brzine zrna, pritiska barutnih gasova piezoelektričnom metodom i vremena opaljenja, kao i nove opitne cevi.

2. U proizvodnju su uvedene nove vrste metaka.

Pored bojeve i manevarske municije, PPU sada u NATO kalibrima proizvodi i obeležavajuću, snajpersku i prigušivačku municiju.

3. Uvedene su nove varijante pakovanja.

Uz određene izmene kod klasičnog načina pakovanja u drvene sanduke, uvedene su i varijante pakovanja municije u redenike, u plastične torbice i u metalne kutije M2A1.

Treba naglasiti da, u skladu sa započetim transformacijama VS, "Prvi partizan" ima u proizvodnji ili razvija i vrši modifikacije svih sredstva potrebnih za zadovoljenje potreba naše armije. Tokom meseca novembra završen je razvoj snajperske municije u kalibru 12,7 x 108 mm, a varijantu ovog metka PPU proizvodi i u kalibru 12,7 x 99 mm.

U proizvodnom programu naše fabrike nalaze se i mnogi drugi kalibri koji se koriste za potrebe vojske, policije i snaga bezbednosti:

Standardna puščana municija ruskog porekla u kalibrima 7,62 x 39 mm i 7,62 x 54 mm sa raznovrsnim tipovima zrna;

Puščana municija zapadnog porekla koja je danas u ograničenoj upotrebi, u kalibrima 7,62 x 63 mm, 7,5 x 55 mm Swiss, 30 M1 Carbine, 303 British;

Kalibri koji su u poslednje vreme u upotrebi za specijalne operacije, 300 Winchester Magnum i 338 Lapua Magnum (u završnoj fazi razvoja);

Pištoljska i revolverska municija u kalibrima 7,65 mm, 9 x 17 mm, 9 x 18 mm Makarov, 7,62 x 25 mm Tokarev, 40 Smith & Wesson, 45 Auto, 38 Special, 357 Magnum i drugim.

Standard rifle ammunition of Russian origin in calibres 7.62 x 39 mm and 7.62 x 54 mm with different types of bullets;

Rifle ammunition of Western origin the use of which is now limited, in calibres 7.62 x 63 mm, 7.5 x 55 mm Swiss, 30 M1 Carbine, 303 British;

Calibres that are lately in greater use for the needs of special operations, 300 Winchester Magnum and 338 Lapua Magnum (in final stage of development);

Pistol and revolver ammunition in calibres 7.65 mm, 9 x 17 mm, 9 x 18 mm Makarov, 7.62 x 25 mm Tokarev, 40 Smith & Wesson, 45 Auto, 38 Special, 357 Magnum and others.

Specijalna municija

Projekat osvajanja proizvodnje specijalne (obeležavajuće i probojno-zapaljive) municije pokrenut početkom devedesetih godina prošlog veka doživeo je određene transformacije shodno zahtevima tržišta. Mnogi kupci imaju potrebu za kombinacijom bojeve i obeležavajuće municije u redenicima, i na ove zahteve PPU nije bio uvek u mogućnosti da odgovori. Sada se u završnoj fazi nalazi osvajanje proizvodnje obeležavajućih zrna u kalibrima 5,56 x 45 mm i 7,62 x 51 mm. Završetkom ovog projekta i osvajanjem ovih vrsta municije fabrika će u saradnji sa „Krušikom“ proizvoditi zrna koja trenutno uvozi i na taj način kompletirati svoju ponudu na programu streljačke municije malih kalibara.

Interesantno je reći da deo kapaciteta za proizvodnju municije 12,7 mm PPU danas koristi za proizvodnju i isporuku standardnih čaura kalibra 50 BMG i, kao jedini proizvođač u svetu, čaura 416 Barrett za američko tržište. Ovde kao veoma značajnu stvar treba naglasiti da “Prvi partizan” ima sopstvenu mašinogradnju i da je razvio skoro kompletan program proizvodnje mašina za proizvodnju municije, koji takođe nudi i isporučuje. Tako je i veći deo opreme koja je urađena za projekat proizvodnje specijalne municije, uključujući i opremu za proizvodnju municije 12,7 mm, upravo delo stručnjaka iz fabrike.

Sportska i lovačka municija

Svestan činjenice da ne može računati na kontinuiranu uposlenost većeg dela kapaciteta na proizvodnji streljačke municije, »Prvi partizan« se davno preorijentisao i krenuo u osvajanje tržišta sportske i lovačke municije.

Današnji program proizvodnje sportske i lovačke municije u “Prvom partizanu” proistekao je iz proizvodnje municije za vojne potrebe, tako da su među prvim lovačkim kalibrima bili 8 x 57 IS (7,9 x 57 mm), 7 x 57 (7 mm Mauser), 308 Winchester (7,62 x 51 mm), 30-06 Springfield (7,62 x 63 mm) i drugi. Zahvaljujući ekspanziji izvoza na prelazu između osme i devete decenije prošlog veka, naročito veoma uspešnom izvozu u USA, “Prvi partizan” je izrastao u jednog od najznačajnijih proizvođača sportske i lovačke municije u svetu, kad je u pitanju asortiman i kvalitet, ali isto tako i količine.

S obzirom da se municija namenjena za komercijalno tržište dobrim delom proizvodi na kapacitetima na kojima se proizvodi i vojna municija, može se reći da je “Prvi partizan” na taj način izvršio konverziju kapaciteta i da ove kapacitete može koristiti za potrebe civilne proizvodnje. Trenutno, u skladu sa zahtevima svojih kupaca, fabrika radi na proširenju asortimana u ovom programu i svake godine izbaci niz novih varijanti postojeće municije, novih tipova zrna i novih kalibara. Rad na ovom programu nikada nije prekidan, ali je posebno intenziviran nakon ukidanja sankcija i otvaranja svetskog tržišta prema našoj zemlji.

Kao posebno interesantne segmente ovog programa, izdvojene u skladu sa potrebama kupaca i trendovima na tržištu treba navesti sledeće proizvode:

Karabinska municija;

Pištoljska i revolverska municija;

„Match“ municija (precizna municija namenjena za takmičenja);

Special ammunition

The project of acquiring production of special ammunition (tracing and armour-piercing incendiary) first initiated in the mid nineties of the last century has undergone certain transformations dictated by market requirements. Many customers need to combine service and tracing ammunition in link belts, a requirement that PPU has not always been in a position to meet. Mastering the production of a tracing bullet in calibres 5.56 x 45 and 7.62 x 51 mm is in its final stage. Once this project has been completed and these types of ammunition have been acquired, PPU will start, in cooperation with Krušik, the production of bullets that are currently being imported. It will thus complete its offer of small arms ammunition.

It is interesting to mention that PPU uses a part of the capacities intended for the production of 12.7 mm ammunition, to manufacture and deliver standard cartridge cases in calibre 50 BMG, and, as sole manufacturer in the world, of 416 Barrett cartridge case for the American market. An important advantage of Prvi Partizan is its own machine building capability, with practically complete program of ammunition producing machines that are also the subject of its offer and supply. Equally, major part of the equipment used in the project of special ammunition production, including equipment for the production of 12.7 ammunition has been the result of PPU’s specialists’ work effort.

Sporting and hunting ammunition

Aware of the fact that a large part of the capacities engaged in the production of small arms ammunition cannot be fully employed on a continuous basis, Prvi Partizan has converted a part of its capacities and directed its efforts to winning the markets of sporting and hunting ammunition.

Today’s program of sporting and hunting ammunition in Prvi Partizan has derived from the production of defence ammunition. The first hunting calibres were 8 x 57 IS (7x9 x 57 mm), 7 x 57 (7 mm Mauser), 308 Winchester (7.62 x 51 mm), 30-06 Springfield (7.62 x 63 mm) and others. Owing to an expansion of export deals in the period between the eighth and ninth decade of the last century, and especially thanks to a very successful export to the USA, Prvi Partizan grew into one of the most eminent manufacturers of sporting and hunting ammunition in the world, with the assortment and quality of ammunition, but with quantities of ammunition as well.

Considering that ammunitions intended for commercial markets are mostly produced using the same capacities which produce defence ammunition, we can say that Prvi Partizan has thus made conversion of its capacities which can now be used for the needs of civilian production as well. At this moment, responding to the requirements of its clients, the factory is extending the range of products in this program; each year, it launches a series of new variants of the existing ammunition, new types of bullet and new calibres. Work on this program has never been interrupted, but it was intensified after the sanctions were lifted and the world market opened up to our country.

Some particularly interesting segments of this program, singled out in compliance with clients’ needs and market trends consist of the following products:

Carbine ammunition;

Pistol and revolver ammunition;

„Match“ ammunition (precision ammunition intended for competitions);

Lovačka municija sa zrnima „Grom“;
Municija u zastarelim kalibrima;
Manevarska municija i čaure;
Municija 9 mm PA Blank;
Komponente (čaure i zrna).

Posebna pažnja u razvojnim planovima PPU poklanja se „ekološkoj“ municiji, kao izuzetno perspektivnom programu za budućnost. Za sada je u pojedinim kalibrima završen razvoj sledećih proizvoda:

Sinter municija sa raspadajućim zrnima;
Pištoljska i revolverska municija sa Total Metal Jacket zrnima;
Vežbovna municija sa plastičnim zrnima.

Kao ilustraciju priče koju smo ispričali, navešćemo uporedo tipove vojne municije koju proizvodi „Prvi partizan“ u tri NATO kalibra i varijante komercijalne municije u istim ovim kalibrima:

5,56 x 45 mm - 223 Remington
7,62 x 51 mm - 308 Winchester
9 x 19 mm - 9 mm Luger

I na kraju, podsetimo šta se sve nalazi u ponudi „Prvog partizana“:

Strelјačka municija
Municija za puške, puškomitraljeze i mitraljeze
Municija za pištolje, automate i revolvere
Municija za protivavionske mitraljeze
Sportska i lovačka municija
Karabinska municija
Pištoljska i revolverska municija
Potkalibarna artiljerijska municija
Oprema za proizvodnju municije
Alati za proizvodnju municije
Oprema, mašine, uređaji, alati, pribori
Medicinska oprema (Operacioni stolovi i pribor)
Ostali proizvodi
Inženjering (Uspostavljanje kapaciteta za proizvodnju municije)

Hunting ammunition with „Grom“ bullets;
Ammunition of obsolete calibres;
Blank ammunition and cartridge cases;
9 mm PA Blank ammunition;
Components (of cartridge case and bullet).

Particular attention in the development plans of PPU is paid to „ecological“ ammunition, as an extremely promising program for the future. For the time being, the development of the following products has been completed in some calibres:

Sinter ammunition with degradable bullets;
Pistol and revolver ammunition with Total Metal Jacket bullets;
Practice ammunition with plastic bullets.

As an illustration of our narrative, indicated below are ammunition types produced by Prvi Partizan in three NATO calibres and, in parallel, commercial variants of ammunition in the same calibres:

5.56 x 45 mm - 223 Remington
7.62 x 51 mm - 308 Winchester
9 x 19 mm - 9 mm Luger

And finally, let us recall all the items offered by Prvi partizan:

Small Arms Ammunition
Rifle, Light Machine Gun and Machine Gun Ammunition
Pistol, Submachine Gun and Revolver Ammunition
Antiaircraft Machine Gun Ammunition
Sporting and Hunting Ammunition
Rifle Ammunition
Handgun Ammunition
APFSDS Artillery Ammunition
Equipment for Ammunition Production
Tools for Ammunition Production
Equipment, Machines, Devices, Tools, Accessories
Medical Equipment (Operating Tables and Accessories)
Other Products
Engineering (Ammunition production capacities installation)

VOJNOMEDICINSKA AKADEMIJA: BALKANSKI HRAM ZDRAVLJA

tradicija, iskustvo i ugled ustanove kojoj se veruje...

Piše
naučni saradnik, dr sc.med. Elizabeta Ristanović

Vojnomedicinska akademija je vrhunska medicinska i naučno-istraživačka ustanova, nacionalno blago, hram srpske medicine i nauke sa tradicijom dugom 164 godine.

Osnovana je ukazom kneza Aleksandra Karađorđevića, 2.marta 1844.godine, kao prva centralna vojna bolnica. Od tada do danas, niže se nepregledan i neiscrpan vremenski đerdan, mnoštvo slavnih imena, uloženog truda i rada da se sačuva zdravlje i odupire sudbini. Iz bitke u bitku, kalilo se ime i ugled ove ustanove i njenih stručnjaka koji su uvek bili uz svoj narod na poprištima balkanskih, oba svetska rata i ratnih 90-tih.

MILITARY MEDICAL ACADEMY: THE BALKAN TEMPLE OF HEALTH

tradition, experience and reputation of an institution that is trusted

By
naučni saradnik, dr sc.med. Elizabeta Ristanović

The Military Medical Academy is ranked top among medical and scientific-research institutions, it is a national treasure and the temple of Serbian medicine and science with a tradition of 160 years.

By the Decree of the Prince Alexander Karadjordjevic of March 2, 1844, it was established as the first Central Military Hospital. Since then, countless and infinite number of jewels have been strung of many a famous name, effort and dedication to safeguard health and resist the twists of fate. The name and reputation of this institution have been forged in battle, its experts being by their

I danas je VMA sa svojim narodom i državom, na braniku evropskih pozicija svoje države i brend Vojske Srbije na putu uključenja u evro-atlantske integracione procese.

Definisana je kao najviša vojno-zdravstvena, naučno-istraživačka ustanova i centar za poslediplomske studije. Pod krovom VMA skladno, integrisano i multidisciplinarno funkcionišu služba lečenja na vrhunskom nivou, uz poštovanje najviših standarda i sopstvenih specifičnosti, edukacija medicinskih kadrova svih profila po evropskim standardima i naučno-istraživački rad na svetskom nivou.

Impresivno arhitektonsko zdanje VMA zauzima površinu od 180.000m2, nalazi se na prostoru od 21ha, u jednom od najlepših delova grada, na Banjičkom visu i predstavlja jedan od prepoznatljivih simbola Beograda.

Pouzdan garant uspešnosti VMA danas je kvalitet angažovanih medicinskih stručnjaka među kojima je 470 lekara, 40 stomatologa, 36 farmaceuta i 1400 medicinskih tehničara svih profila. Nastavno-naučni potencijal kuće čini 135 profesora, 186 doktora nauka i 78 magistara. Iskustvo i znanje prenose se sa generacije na generaciju, uz permanentno unapređenje tehnoloških procesa i dijagnostičko-terapijskih procedura.

VMA u svom sastavu ima 27 klinika, 17 instituta, Dijagnostičko-poliklinički centar, Centar za kontrolu trovanja, Trauma centar, Centar hitne pomoći, Centar za transplantaciju organa i kostne srži.

Kapacitet VMA čini 1200 bolničkih postelja i godišnje se u ovoj kući hospitalizuje 30.000 bolesnika, obavi oko 30.000 hirurških intervencija i više od pola miliona specijalističkih pregleda.

Prednost bolnice centralnog tipa jeste i u tome što se konzilijum najsposobnijih stručnjaka svih profila može oformiti za 10 minuta, tako da se i najkomplikovaniji medicinski problemi rešavaju brzo i efikasno.

Nacionalna, verska i rasna pripadnost ili status zdravstvenog osiguranja nikada nisu bili uslov za korišćenje usluga VMA.

VMA je bolnica otvorena je za sve naše građene u zemlji i rasejanju kao i strance koji žele da koriste više od 5000 različitih dijagnostičkih i terapijskih procedura, od najjednostavnijih do veoma složenih kao što su transplantacije tkiva i organa i komplikovani operativni zahvati.

people in the Balkan Wars, both World War I and II and on the battlefields during the war-affected 90s.

Even nowadays, the Military Medical Academy is, together with its people and the state, a defender of the European positions of Serbia and the brand of the Armed Forces on their way towards the Euro-Atlantic integration processes.

It is a top military healthcare facility, a scientific-research institution and a center for postgraduate training. Under the roof of the Military Medical Academy, treatment, education of medical personnel of all profiles as well as scientific-research are fully integrated and multidisciplinary coordinated in accordance with the highest standards and its own specifics.

The impressive architectural complex of the Military Medical Academy covering the area of 180.000 square meters is situated in one of the most beautiful suburbs of the city of Belgrade, on the Banjica hill, representing one of its recognizable symbols.

The expertise of the MMA's medical personnel including 470 physicians, 40 dentists, 36 pharmacists and 1400 medical technicians of all profiles is a reliable guarantee of the MMA's success. The teaching-scientific body of this institution comprises 135 professors, 186 holders of Ph. degree and 78 holders of a master's degree. Experience and knowledge have been passed down from generation to generation along with the continuous advancement in technological processes and diagnostic-therapeutic procedures.

The Military Medical Academy has 27 clinics and 17 institutes. It houses the Diagnostic Outpatient Clinic, Poison Control Center, Trauma Center, Emergency Center and Center for Organ and Bone Marrow Transplantation.

In this 1200 inpatient bed tertiary care hospital, around 30,000 patients are hospitalized, about 30,000 surgeries are performed and more than half a million specialist examinations are carried out each year.

The advantages of a hospital with centralized care ensure that a consultation meeting of the most skilled medical experts of all profiles can be called up in 10 minutes to respond urgently and effectively to the most complex and challenging medical cases.

Nationality, race or religious affiliation or any type of health insurance have never been and will never be a precondition for enjoying MMA'a services.

MMA is a hospital open to all our citizens in the country and expatriates living and working worldwide as well as to the foreign citizens who can use more than 5000 various diagnostic and therapeutic procedures ranging from the most simple to the most complex and highly expensive services, such as complicated surgical procedures and tissue and solid organ transplantations.

Prices are very favorable. The medical services are billed according to the price list identical for both the citizens of the Republic of Serbia and for foreign citizens. Having signed the medical insurance contract with national insurance companies, the MMA can now offer their clients additional exclusive medical services and benefits.

Cene usluga na VMA su pristupačne. Identičan cenovnik primenjuje se za građane Republike Srbije i strance. Potpisivanjem ugovora o dobrovoljnom dopunskom zdravstvenom osiguranju sa osiguravajućim kompanijama potencijalnim korisnicima obezbeđene su dodatne pogodnosti u korišćenju usluga VMA.

VMA primenjuje vrhunske metode dijagnostike u svim oblastima medicine. Transplantacioni program se radi rutinski i obuhvata transplantacije bubrega, jetre, koštane srži i matičnih ćelija. Prvi rezultati terapijske primene matičnih ćelija u slučajevima multiple skleroze, oboljenja jetre, dijabetesa, akutnog infarkta miokarda ili hronične srčane bolesti su ohrabrujući i zapaženi na svetskom nivou.

Hirurgija je, od osnivanja do danas, zaštitni znak VMA. Implantacija veštačkih diskusa u slabinski i vratni deo kičme, primena navigacije u ugradnji veštačkih zglobova, operacije na zadnjem segmentu oka, transplantacija jetre sa živog davaoca, kombinovana otvorena i ćelijska kardiohirurgija samo su neka od dostignuća stručnjaka VMA u proteklom periodu.

Jedinstvena iskustva u oblasti urgentne hirurgije primenjuju se u svakodnevnoj praksi, a još jedna novost i osobenost VMA je primena modela dnevne hirurgije koji omogućuje da se bolesniku istog dana utvrdi dijagnoza i uradi hirurška intervencija, a zatim se, posle opservacije, uputi na kućno lečenje.

Menadžment i stručnjaci VMA svesni su činjenice da nema moderne medicine bez savremene tehnologije. I u tom smislu VMA ide krupnim koracima napred, prateći i primenjujući najviše medicinske standarde. Nabavljen je multislajsni skener najnovije generacije koji ima neograničene mogućnosti za dijagnostiku i praćenje toka lečenja, opremljen je sterilni hematološki blok, a nadograđen je i linearni akcelerator koji služi za lečenje malignih bolesti, najsavremeniji u ovom delu Evrope.

VMA je nenametljivi, ali nesporni lider u mnogim oblastima medicine na Balkanu i jugoistočnoj Evropi, a po oceni nezavisnih međunarodnih stručnjaka i srpski superbrend u oblasti zdravlja i lepote.

The Military Medical Academy applies state-of-the-art diagnostic methods in all the fields of medicine. The kidney, liver, bone marrow and stem cells transplantations are performed as routine procedures. The first results of therapeutic application of stem cells in multiple sclerosis, liver diseases, diabetes, acute myocardial infarction and chronic heart diseases are encouraging and recognized in the world.

From its establishment to date, surgery has remained a trademark of this institution. Implantation of artificial vertebral and lumbar disks, the application of navigation system to assist in accurate fitting of artificial joints, surgeries in the posterior segment of the eye, living donor liver transplantations, combined open heart and cell surgeries are only some of the acomplishments of the MMA's experts in the previous period.

Unique experience gained in the field of emergency surgery is applied in everyday practice. The introduction of the same-day surgery model as one of the MMA's novelties and specifics has ensured performance of diagnostic and surgical procedures and sending a patient home for further home care on the same day.

The MMA's management and medical professionals are well aware of the fact that modern medicine is impossible without the state-of-the-art technology. In view of this, the MMA advances rapidly by following the highest medical standards. The multislice CT scanner of the latest generation with unlimited diagnostic capabilities has been purchased. The linear accelerator used in the treatment of malignant patients has also been upgraded, and is now the most sophisticated accelerator in this part of Europe.

The Military Medical Academy is, unquestionably, a leader in many fields of medicine in the Balkans and Southeastern Europe and, as assessed by some independent international experts, the Serbian brand in the health and beauty domain.

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