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APPLICATIONS OF ADVANCED MATERIALS IN ROMANIAN MILITARY TECHNOLOGY FOR REDUCING THE ARMORED FIGHTING VEHICLES' VIBRATIONS

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Abstract. It seems that the military intervention mode is in a changing process with the new millennium. The creator process to obtain materials very advanced, efficient, resistant, not be battered, not be heavy, can be easy processed and to combine more specific featuring. The tanks and armored combat vehicles, as every land automobile, don't have surplus of suspension and own shock absorber (damper), so the shock and vibration effects are more aggressive for the attendance persons in this type of motorcar that other motorcar. In the tank soldier activity, the main problem is to be insured some specific conditions in order to eliminate or reduce the vibrations and their effects; these are much needed aspects for accomplishing the combat missions. The using of composite materials in order to damp the shocks and vibrations, in armored combat vehicles, is very useful for a long distant movement or while the fights. Concomitantly, all these are further argument for the designer of combat technique to ameliorate the life and fight conditions on armored combat vehicles. The impressive technological progress using the new discovery and combination in advanced materials applied in military technique has lead to a new perception of the military interventions.

Keywords: advanced materials, armored combat vehicles, vibrations' effects

1. General aspects of composite materials

In now conditions, to replace classical materials with modern ones, with upper technical-functioning and economic features is a very necessity, especially armored engineering field, in naval and aerospace industry and many more areas. The seeming response is simply: „new materials", composite based on boron filament, on glass, on asbestos, on carbon and Kevlar, nanomaterials, materials with form's memory, amorphous metallic materials and so on.

2. A short presentation of advanced materials in Romanian military technology

The tanks and armored transporters, as any land motor, don't have surplus of suspension and own absorption, so the effects of the shocks and vibrations are more aggressive for workers in this field, toward over kind of vehicle. The main problem in the tank-man activity is to ensure some specific conditions for reducing or even eliminating the vibrations and their effects, much needed aspects for achieving the fight missions.

The vibrations effects for human body, generally, and for tank-mans, especially, are not very cleared, in their whole complexity. The lab studies regarding the influence of the vibrations on human body have been made generally in environment of exciting with sinusoidal vibrations. But, during driving a tank or armored transporter on hilly land, the vibrations of it are certainly different against the lab experiences. The land where the tanks are used is so hilled that the multidirectional requesting leads to resultant forces much bigger than that who actions in the lab experimental situations.

The made studies emphasize the strong influences of the vibrations because of the un-skimming, over the drive-mechanics' health and especially, the reducing of the driving capacity in optimal conditions. The research results have underlined that is happening a significant impact on the driver ability, especially regarding peripheral observation capacity, maintaining the equilibrium and maintain a constant pressure of the foot on the pedals.

In the theoretic and experimental studies of the tanks it is replaced the real model (figure 1 a) with its equivalent model (figure 1 b). In the equivalent scheme, the body of the tank is drawn as a metal bar with two degree of freedom (it can make vibrations on vertical and balance in

rocking). There are coupled six weights by this metal bar (from m_{r1}, to m_{r6}, figure. 1 b), that are the cobble. The metal bars for torsion and helical spring have the flexible constants k_1...,k_6, and the silencers, silencer constants C_1, ... C_6. The caterpillar features and rubber bandage on cobble are drawn by the elastic constants k_{r1}…, k_{r6} and silencer constants C_{r1}, … , C_{r6}.

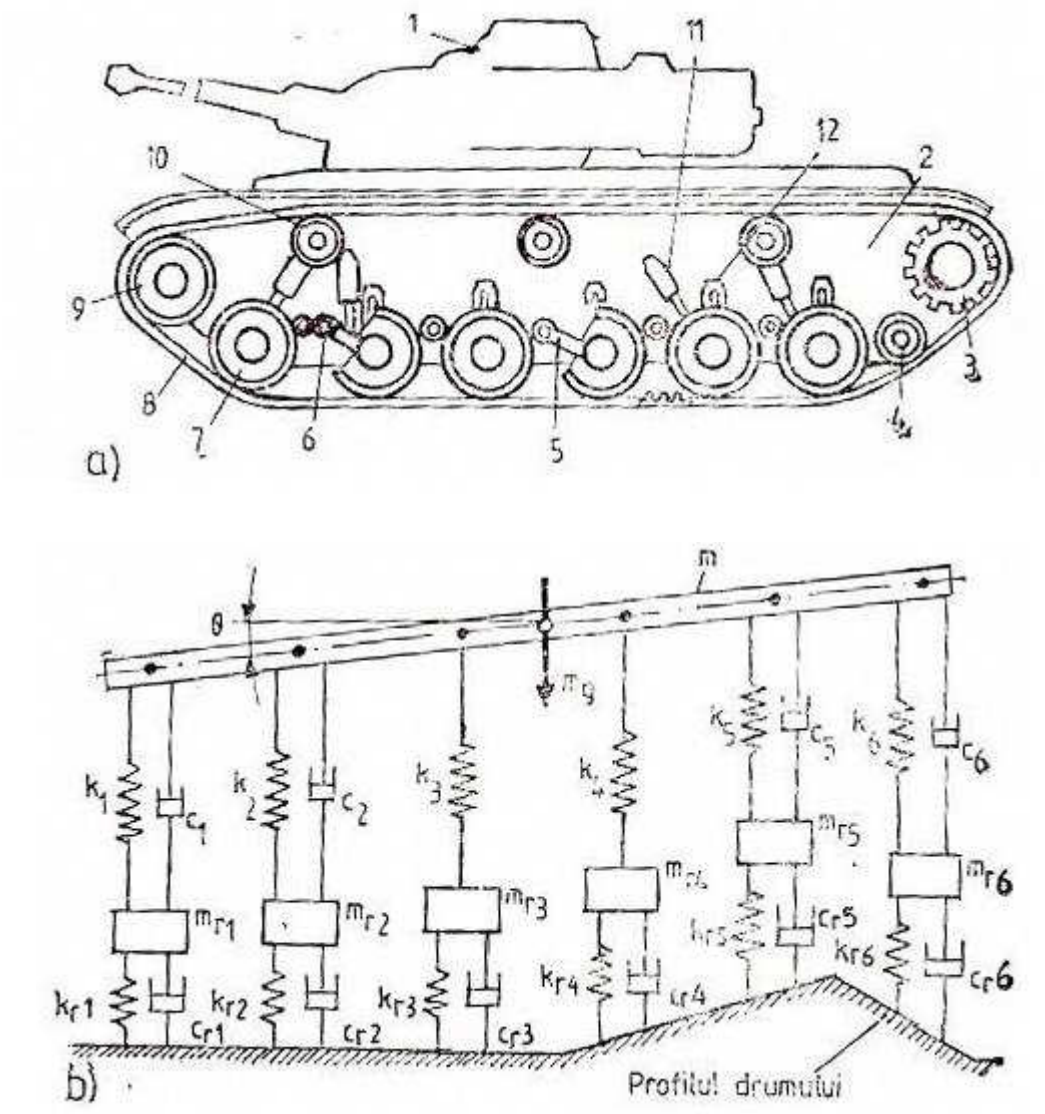

Figure 1. The tank –the real model (a) and the equivalent model (b)
1 – cupola; 2 – tank's body; 3 – brake drum of training; 4 – wheel for guiding and traction; 5 – oscillatory arm; 6 – torsion bar; 7 – cobble wheel; 8 – caterpillar; 9 – wheel for guidance and extent the caterpillar; 10 – support reel; 11 – shock silencer; 12 – helical spring

In the case of armored transporters, using composite materials for deaden the shocks and vibrations are very useful during very large distances motion or during the fight. Concomitantly, these are further arguments for the drafts-mans of fighting technique for improving life and fight conditions on armored vehicles.

3. Challenges and opportunities for Romanian military industry

The military industry and the national defence activity field can benefit through the framework program of the European Union, settled for Lisbon objective achieving, according to the low and national security strategy, for guarantee the state sovereignty, independence and unity,

territorial integrity of the country and of the constitutional democracy.

According to the Low no. 395 from 16/12/2005, published in Official Monitor, Part I nr. 1155 from 20/12/2005, came into from 23/12/2005, regarding the suspend of the compulsory military service on peace time and passing to military service based on voluntary, starting with 1 January 2007, the compulsory military service as term soldier or reduce term soldier, is suspended. It follows achieving a performed army both from quality and labour improvement point of view and regarding military industry quality, endowment the army according to present challenges. The system of promoting the military profession, recruitment and selection, ensure the maintaining of military structure efficacy by providing a certain quantity of human resources, in a certain quality and in settled terms.

The EU aquis regarding the national defense, public order and national security, provides a generalization of employment of economic agents in services performance for the army. Also it regards the dispensation from value added taxation for imports of military technique, materials, changing pieces, components, equipments and services of them, for army endowment. A special accent is put on military system computing, on scientific development of communication and intelligence technology, on the guarantee of regulation regarding legislative framework enhancement in order to ensure an equilibrated competition framework in telecommunication industry field, stimulation of telecommunication firms competition, stimulation of intelligence technology national industry, both on hardware component and software, and communications on national defense system direction.

Even if Romanian army has confront with endowment problems, that are otherwise inherent economic situation, for moment it has performed technique, equipment and materials: infantry armament category, included heavy armament, fighting technique of mechanized infantry endowment, terrestrial and antiaircraft artillery, mill engineers, EOD, NBC, watching apparatus and sighting on night condition, systems for fire leading and ordering, communication and informatics modern technique, equipments in parachutists endowment, military and battle dress. About military technique, for the last moment, there are: unarmored fighting vehicle for special ops, Uro Vamtac type– a modern means of fighting very mobile, recently has come into Special Ops Forces of Romanian Army endowment – armored amphibious transporter B-33 "Zimbru", infantry motors for fight MLI - 84 M ‚Jderul", artillery technique of Larom system, launching installation CA – 95, land-air missile systems with the base on ground Hawk, antiaircraft system 2×35 mm "Viforul", radio auto-station "Panther" (with frequency leap) and "Harris – Falcon II" (ensure radio communication at tactic level), station for mil reconnaissance radiolocation "SHORAR – TCP", "A.A.Oerlikon" installation, reactive missile thrower by 120 mm, special vehicles for lighting and unlock-up on auto-chassis Mercedez Vito, special automotive mobile control and command station on auto-chassis VW Transporter, chemical and nuclear research special automotive on auto-chassis VW Transporter, special automotive for extinction with water and foam by medium capacity on auto-chassis Renault, special automotive for extinction with water and foam by high capacity on auto-chassis Iveco Magirus, helicopters IAR 330 Socat, airship IAR 99, airship MiG 21 LanceR and many other modern technique in Romanian military unities endowment. And all of these are operated by professionals, with an amazing training and firmly.

The science progress contributes to any new war with new military arsenal but also with elements of continuity in the field of techniques and technologies.

4. Conclusions

It seems military intervention modality is in a permanent changing once upon the new millennium and its challenges. The creator effort for obtain performed materials having resistance, not be easily damaged, not to be heavy, easy to be manufactured and processed is a defined feature of contemporary technological progress. They have to combine more specific features: to harmonious join a set of classical materials qualities, but without their defects, to have mechanical resistance and large possibilities for processing like iron but not to be yielding to corrosion, to be easy like mixed aluminum but with mechanical resistance much higher, to have great malleability like the wood but not be inflammable and un resisted to atmospheric or biologic agents.

The impressive technological progress using the new discovers and combinations in advanced materials applied in military technique have

already led to a new perception of military interventions, turning up to so called „war away". Instead the formerly battles, the real war will suppose to scan a battle-field, to identify the potential targets, sorted in order of importance and then to destroy these targets with "clever" arms from beyond battle line. This is the „high-tech" war, that needs to use only some high technology arms and on a large scale, the air force for destroying the vital economic and military objectives of the enemy. Spite, a performed army has to be ready anytime to unfold land troops in that war theatre, if the situation needs, troops that represent the best vector of military action, mostly if these troops have a suitable training and are proper projected, super trained and super endowed with the newest „high-tech" equipments, anywhere the situation will require. So, the infantryman will become a software fighter, in a computer era and electronic and actual high technology means, becoming a real combatant endowed with intelligence, skill, tenacity, agility, perseverance, courage, force, powerful, physic resistance, self controlled and professional in stress situations. The battle field will be transformed in a hyper technical area, where the soldier will be not only an infantryman but a super qualified specialist in computers, like an engineer on instrument board. Knowing that those who was able to adapt to the present rhythm enforced by the world evolution were conquerors, and those who stagnated or were late were vanquished persons, the soldier of third millennium will be a complete soldier, both as physic and psychic training, and technical endowment, and the Romanian soldier can not be excluded the present trend of new military millennium.

All of what was presented in this work represents only a limited set of information for stimulate the research activity in advanced military technology and technique, and like rules in a competed economy, the "post-modern military unity" has to bring a plus value to the national and international economic-socio-politic framework.

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