

MODALITY OF COMBAT VEHICLES DESIGN USING MULTI-FUNCTION COMBAT PLATFORM AS AN EXAMPLE

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Abstract

The permanent process in technical means perfection is a basic determinant of changes at contemporary and future combat battle-field. Period of rapid quality change is, among other things, implementation of modal design to military vehicles construction. Creation the modal design structure that takes into consideration user's and manufacturer's goals shall make easier to implement innovations, to match production programmes as well as to create opportunity to compensate losses by means of modules exchange.

This article represents the newest trends, which are fundamentally in modern combat area. It is shown, how actually is making of selection of light forces, increasing mobility and level of unification of light military vehicles, base on experience of OBRUM Co. Ltd. in module vehicle construction. Moreover there is demonstration with simple examples realized in OBRUM Co. Ltd. of that how it is possible to unificate combat vehicles both tracked and wheeled with the aid of modular designing of particular sub-assemblies. Additionally showed actual requirements come from menaces of contemporary combat field for modern military vehicles and methods of designing of them. Accomplishment of the tank will be possible at decided main participation of Polish defence industry.

Keywords: *Vehicle, tank, engineering machine, platform base, module*

1. Introduction

Innovation technologies that have been presented during recent conflicts exert specific pressure to combat actions within the scope of five trends:

- lethality and reconnaissance,
- precision and combat force,
- integrating technology,
- opportunity and efficiency,
- invisibility and detectability.

The recent technical progress and evolving future battle-field effect constitute renaissance of light military troops. Light forces may be divided generally to:

- aero-mobile ones (of up-to-now form),
- general military ones (using the unified platform).

In accordance with Defence Capabilities Initiative DCI NATO requirements, part of military forces is to be adapted to efficient and prompt deployment beyond domestic territories that could be mainly achieved by utilization modern transportation means, including armoured APC (wheeled and track-laying ones).

The highest unification level of combat and logistic equipment has to be the basis of mobility (tactical and strategic ones) of these forces.

Long period of time of combat vehicles utilisation is justified also by requirement of modal design, which makes possible to adapt this system within this period of time to present conditions,

at low expenses as well as make possible further development in future of the whole system and its components.

Taking into consideration present military conflicts, future vehicle should meet the main requirements:

- balance general protection adapted to diversified conditions against operation of weapons and ammunition as well as detection and identification,
- high operation and technical mobility as well as strategic flexibility,
- ability to run continuous operation under noxiousness geographic and climatic conditions,
- availability of sufficient usable area (volume) and ability to transfer large volume of equipment provided for various tasks,
- providing opportunities to mount standard military armament of given state (APC importer).

2. Main requirements put in relation to future combat vehicles

Taking into consideration the highest unification level of combat, logistic equipment, we have to state that the specific requirement for transportation means of light forces shall be balanced meeting of mutually excluding criteria (for instance, ballistic protection – inner volume – mass). Thus, we should not expose a high level feature in assumed designs but balance all of them at reasonable level.

Analyses of specialistic references, FCS and GTK programmes indicate that one main requirement while constructing future APCs shall be modal design useful for further development in future. This requirement mainly contributes to cost optimising during the whole life.

3. Modal design of combat vehicles

In armoured equipment actually in use of military troops, including tracklaying and wheeled vehicles, combat tanks, infantry vehicles are featured with the highest level of complicity and integrity, as well as – at appropriately lower level – self-propelled artillery, technical and engineering vehicles as well as APCs.

High level of integration causes difficulties in technological operations while they are constructed, during inspection methods and construction elements are heavy without possibility to regenerate them at battle-field.

Highly integrated construction made according to standard project methods, provide so called performances but they also influence high manufacture, repair and procurement expenses.

Changing the project method that assumed design segments disintegration principle, being advantageous from point of view of manufacture and usage techniques, i.e. such methods that influence manufacture, inspection and assembling, we may meet a lot of economic criteria of manufacture and operation of combat equipment.

According to project methodology, this new type of design that confirms existing the firm actual connection between construction form and manufacture methods, and then operation, called schematic modal construction, has been presented in the below Fig.

This new construction type in armoured equipment allows creating operation configuration of armoured vehicle, that give an opportunity to optimise basic equipment and combat set to accomplish specified task.

We may assume as module a unified design centre, of exchangeable form, having shape of exchangeable segment of complete device or unit.

By mission (operation) set we could name this its part - also in form of single or compound modal set - characterized by specific functional character.

Thus, in case of APC the mission module shall be armoured loading volume or load-unload device in case of specialistic containers transportation.

SEP MULTIROLE ARMoured VEHICLE PLATFORM

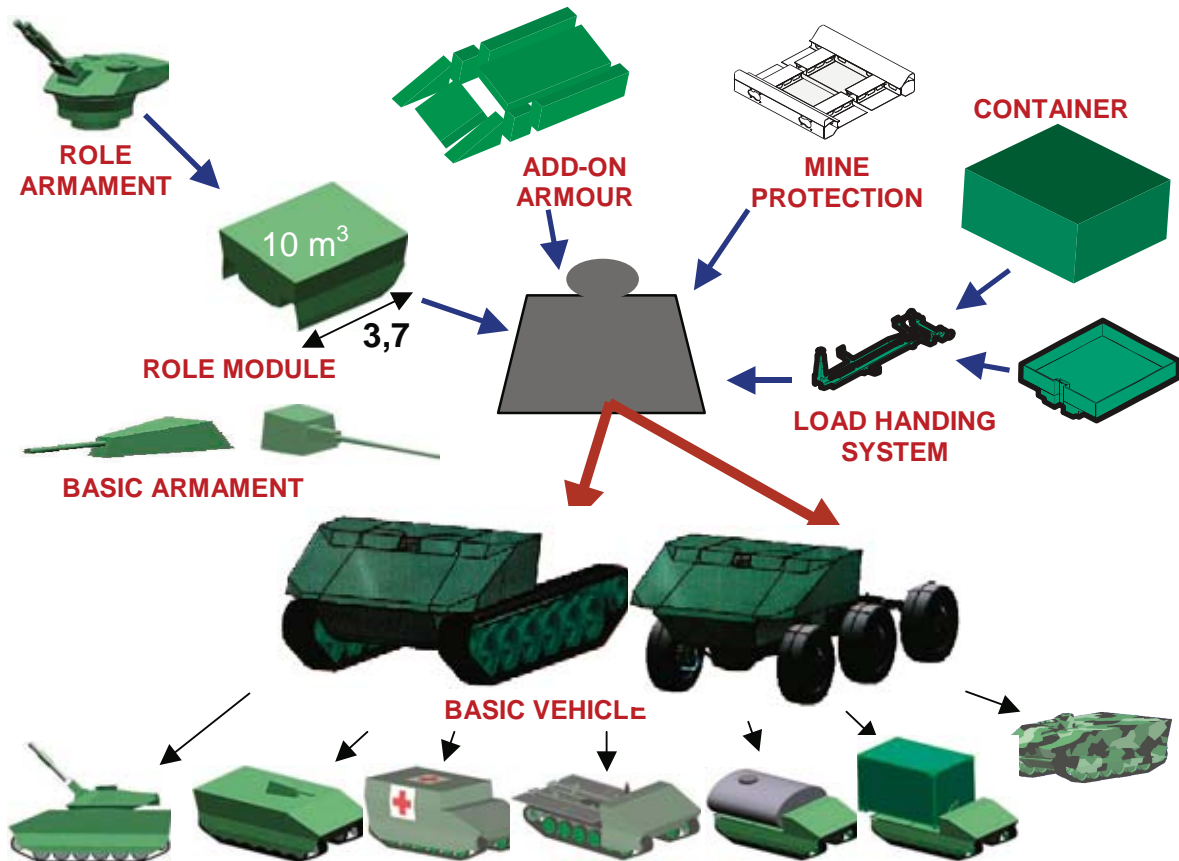


Fig. 1. Multirole armoured vehicle platform

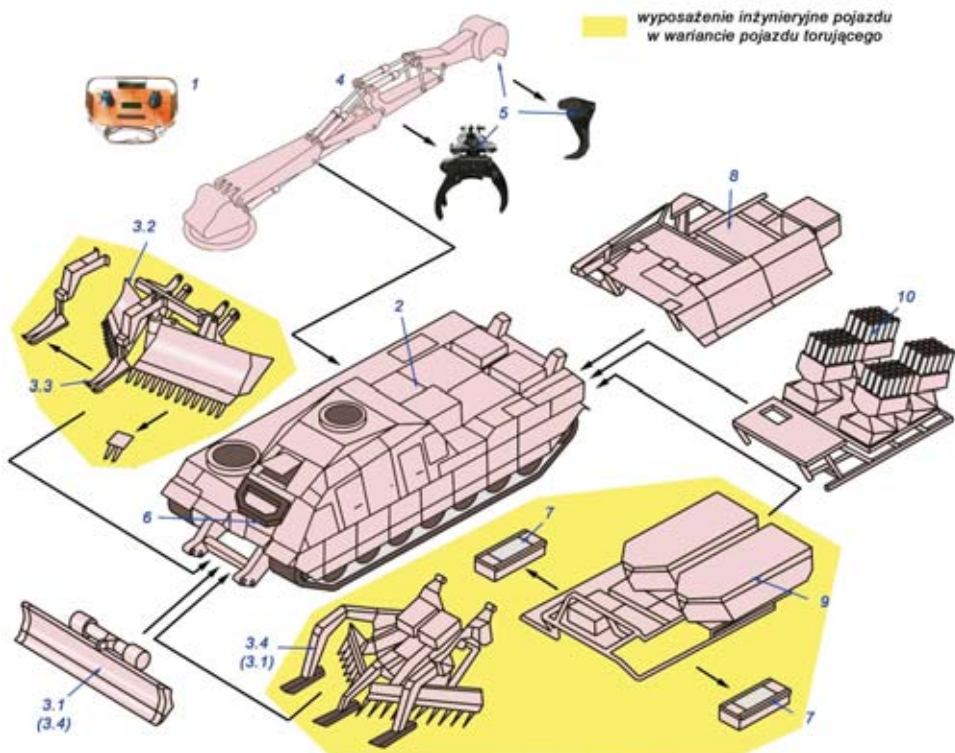


Fig. 2. Engineering equipment of clear variant vehicle

For infantry fighting vehicle, crew compartment together with ramp that allows "jumping off" the team shall be the mission module, equipped with device to overcome contaminated terrains. In commander and control vehicle, in mission module, the below mentioned items shall be located: necessary devices that allow imaging the present situation at battle-field as well as automated fire control system. Commander vehicles shall be equipped (in mission module) with equipment that depends on purpose:

- logistic chief commanding vehicle – the standard ones adapted to subunits in logistic troops.
- commanding vehicles and commander-headquarters WR and A – the standard ones the same as for other equivalents in Tactic Units and general military troops.

Self-propelled mortars shall be equipped with fire module composed of navigation equipment, fire management system, automatic single-barrel or double-barrel mortar including feeder and ammunition magazine module.

There is opportunity to develop fire module to gun of tank type, fed automatically with ammunition located in crewless turret. We obtain, in connection with drive module, the tank system.

Thus, there is opportunity to develop mission modules for new vision of future battle-field and back-up facilities service as well as humanitarian actions, including sanitary modules and hospital containers as well as social devices.

Drive module including wheel or tracklaying system (wheel-tracklaying), equipped with handles and quick release couplings to assemble mission module as well as system necessary to put in motion, including drive system, transmission, control, internal or external communication source.

4. Experience of OBRUM Sp. z o.o. in module vehicle construction

Within eighties of the recent century, OBRUM had made reevaluation of design methods while SPG-1 high-speed tracklaying vehicle was executed; the vehicle constituted then science-technical back-up facilities opportunity test of our industry and the trial to create in our country a new perspective within the scope of high-speed tracklaying tractors. SPG-1 has been designed as radiolocation equipment NUR-21 carrier composed of load-carrying frame, three basic modules as well as operation set shown on drawing below.

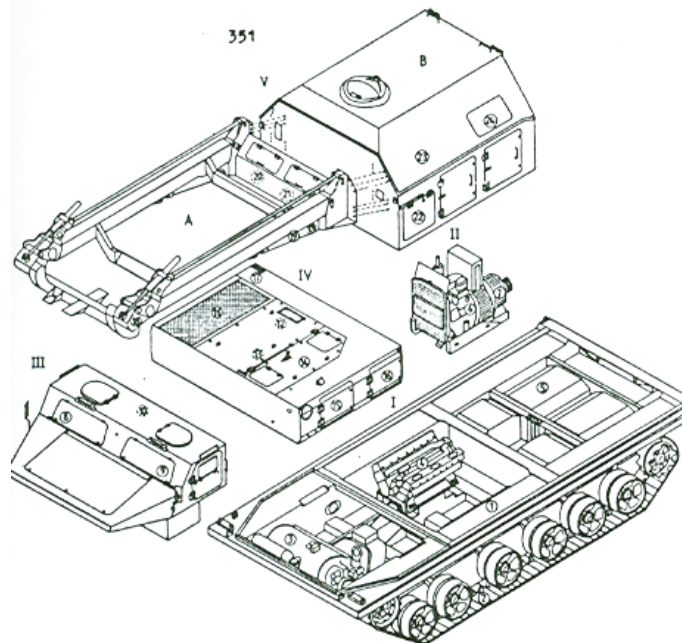


Fig. 3 Modular construction of SPG-1

- I – Load-carrying frame (1 – body), 2 – chassis, 3 – hydro-mechanical gear, 4 – main engine, 5 – fuel tank),
- II – power unit module (6 – engine, generator and controller units, 7 – double generator),
- III – crew module (8 – radio-navigation equipment of commander, 9 – control – steering equipment of mechanic and driver, 10 – measurement and control set of units),
- IV – equipment module (11 – ejector with coolers, 12 – air heater, 13 – main engine systems assemblies, 14 – power unit compartment, 15 – heating and filtering-venting compartment, 16 – batteries and electric equipment compartment, 17 – fuel fillers),
- V – operation system (A – antenna support system, 18 - slewing mechanism, 19 – crane jib lifting mechanism, 20 – hydraulic drive compartment, 21 – heating compartment, B – apparatus and service container, 22 – air-conditioning, 23 – electronic equipment, 24 – filters and ventilation).

This principle has been applied also later in products, for instance, engineering and road machine body that constituted the construction base of WZT-2 Technical Support Vehicle executed within the scope of Malaysian contract.

SUM "KALINA" vehicle is also continuation of operation within the scope of modal design of special vehicles. Self-propelled mine layer KALINA contains, among other things, in its body mines magazines, feeding devices, module control and programming system that programmes operation of mine layer device as well as a plough and a scraper for covered mining as well as crane made as modules as well.

Due to exchange of modules, i.e. mine magazines, digger device and crane to water tanks and foam agent when fire-hose nozzle is mounted in front of the crane as well as other plough type we obtain Czech extinguisher vehicle to fight fire on difficult terrain, destructed zones and forests.

The next solution of module design is PWU-148 product that constitutes anti-aircraft armament carrier, where, due to exchange of turret unit WU-148 we obtain anti-aircraft rocket set or artillery set. The chassis P-148 may constitute a carrier of other units as well. It is worth to state that revaluations undertaken in eighties by OBRUM in design methods yield a series of specialistic solutions.

One of the recent concept project executed in OBRUM Co. Ltd. is „KTO – WPT ROSOMAK”. This vehicle, as technical support vehicle, is designed also as module construction on the basis of base version KTO – ROSOMAK. The vehicle of such version has been equipped additionally with crane, bulldozer development, supports that stabilize crane operation as well as several other sub-units that determined its application. The below drawing shows the concept of such technical support vehicle.



Fig. 4. Technical support vehicle “KTO – WPT ROSOMAK”

At present, the concept works are led over execution of tank equipped with residual turret on the chassis of multipurpose combat platform. The multipurpose combat platform has been provided to meet many functions within the scope of load-carrying module frame. Thus: tank, APC, infantry fighting vehicle, command and control vehicle, ambulance, technical vehicles, engineer tank, clear the way vehicles, technical support and other ones may be applied.

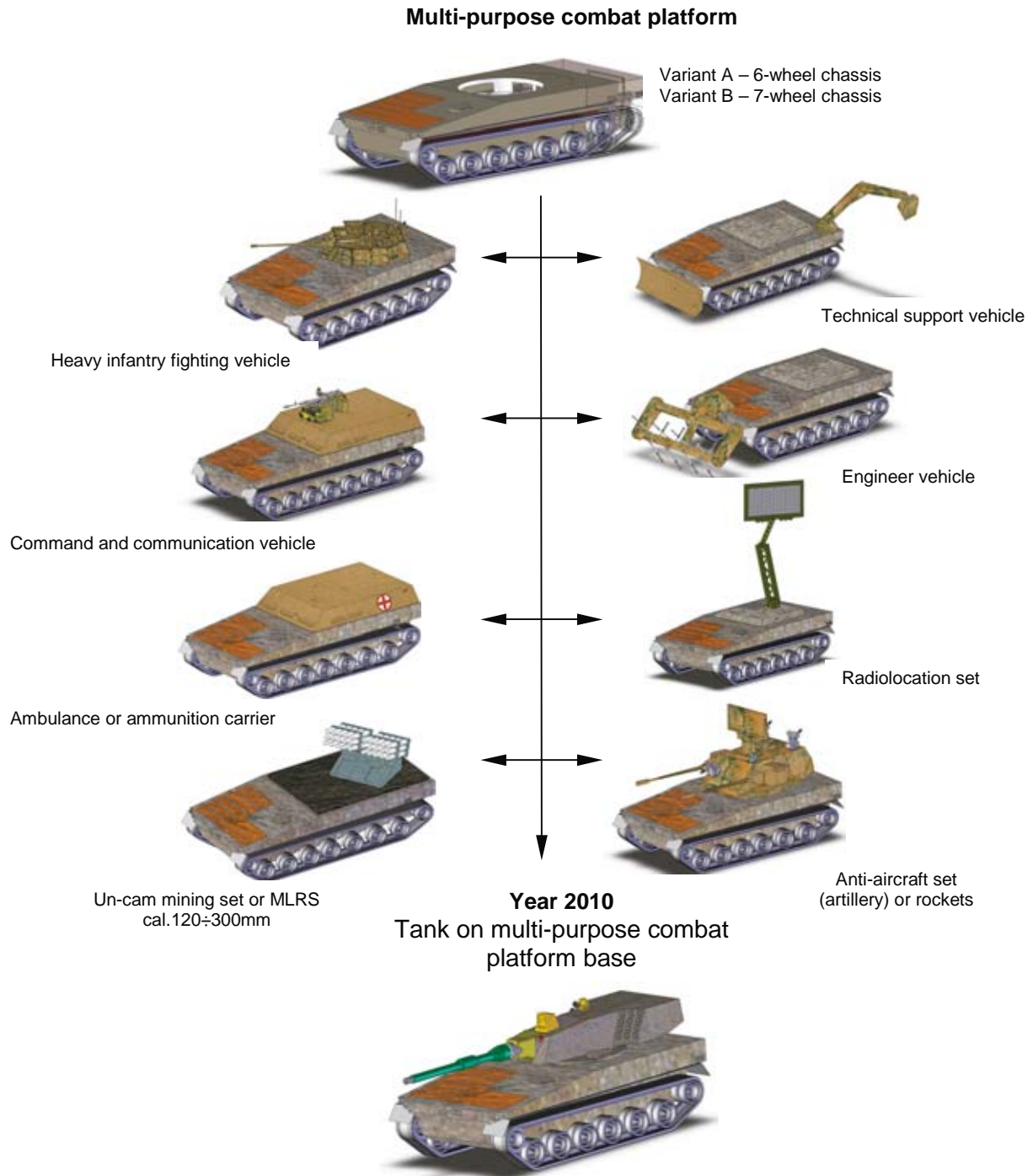


Fig. 5. Multi – purpose combat platform

5. Conclusions

1. OBRUM Sp. z o. o., in its 40 years activities, has become a precursor of module designs (SPG-1, SUM „KALINA”, BWP2000).
2. Design modality provides opportunity to divide to separate sub-units executed by many partners that make easier to implement innovativeness.
3. Summing up the concept of tank using multipurpose combat platform, we may state that execution shall be accomplished at decided major participation of Polish defence industry.