FEASIBILITY OF ELABORATION OF MLRS-P ROCKET SYSTEM WITHIN POLISH MILITARY INDUSTRY

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Abstract

Feasibility study of Missile System MLRS – P with capability of using research and development Polish scientists units and defense industry. Article including schedule of development MLRS – P system. There are presented designing abilities concerning launch of rockets caliber 227 mm and 607 mm, fire control system (SKO) and command system. Additional information contemns functionality of logistics support system. Great deal of subsystems, except rockets, is feasible to elaboration within domestic military industry. Acquisition of rockets for presented system is possible within multinational cooperation, but it is suggested that construction elements should be produced in our country. Presented subsystems are parts of Rocket Fire Module. Separate case is superior communication for information exchanging, particularly concerning parameters of targets. Within that matter there were emphasized requirement connected with designed command and fire control systems. Commanded system and fire control is very good systems in Rocket System BM – 21M.

In the paper the main parameters of MLRS system are presented. The proposed solution of logistics support subsystem is described as well as a new domestic fire control and command system.

Keywords*: feasibility study, Missile System MLRS – P systems*

1. Introduction

Polish Armed Forces are interested in acquisition of modern rocket system which has range of fire up to 300 kilometres. Thus there is need to elaborate prototype and put to Armed Forces Battalion's Fire Module of Multiple Launches Rocket System. The scheme of Fire Module of Multiple Launches Rocket System is showed in Figure 1.

The module comprises executing and support systems. Executing subsystems are rocket launches with fire control system. Supporting subsystems are as follows: Command Subsystems, Logistics Support Subsystem and Top Level Systems providing information about weather conditions and enemy movement. Below it is given information about abilities of elaboration basic subsystems of Fire Control Module.

2. Multiple Launch Rocket System

Examples of construction rocket launches MLRS class is presented in Figure 2.

Unloading and loading launch by transport-launch containers with ammunition should be mechanized. There is proposal to put MLRS – P launch on the chassis of truck-terrain vehicle made in Poland class road-terrain JELCZ P662D.35 6×6 o with load capability 10000kg. JELCZ P662D.35 is equipped with hermetic hull 144WPP which is hydraulical deflected and guarantee crew ballistic safety according to level I STANG 4569. Vehicle is powered by engine ZS *Iveco Aifo Kursor 8*, with power 259kW according to standard EURO 3 existing in Polish Armed Forces.

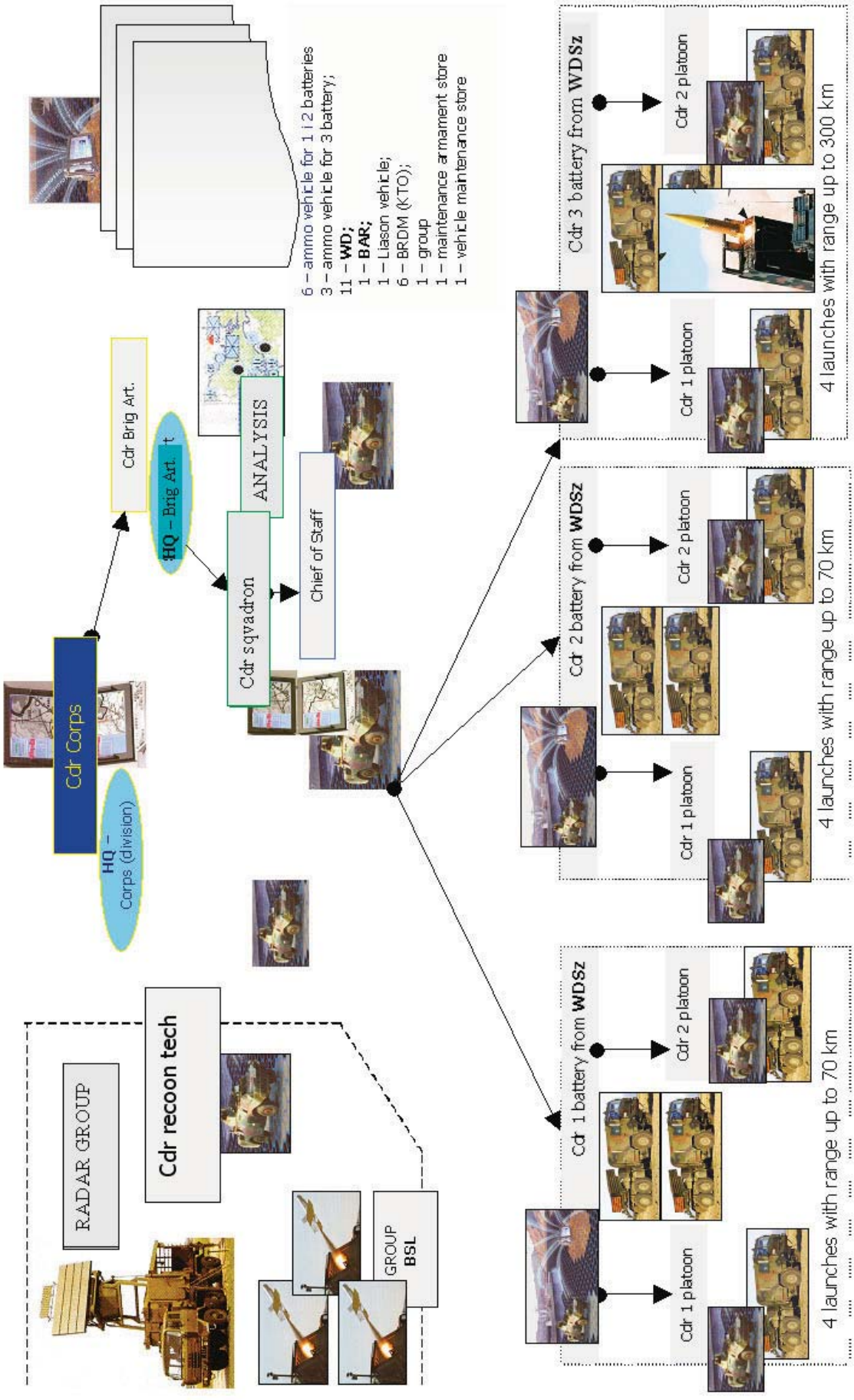


Fig. 1. The scheme of Multi Fire Module of Multiple Launches Rocket System

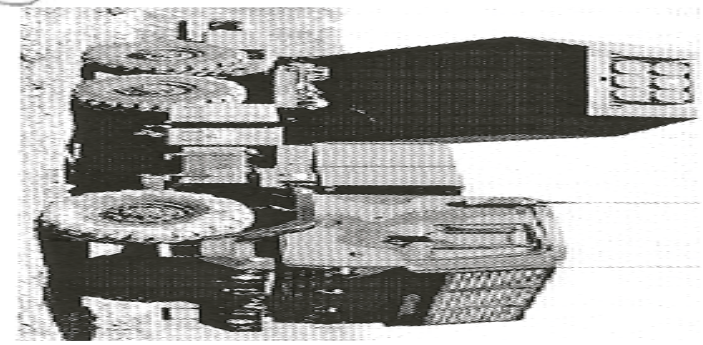
Weight of full loaded launch – with subsystems of chassis of launch load-working and fire unit caliber 227 mm will be up to 25 t what enable crossing of bridges on the public roads.

Vehicle class JELCZ P662D.35 may be adopted to launch MLRS-P, manufactured and equipped with loading-unloading devices of launch-load container. It is requirement that maximum weight of load-unload system and launch–load containers should be up to 10 tones.

Special equipment and fixing of systems and chassis JELCZ P662D.35 is feasible in HSW Sp. z OO workshop. Experience during designing of multiple launch system BM-21M is doubtless useful to fulfil this task.

Vehicle JELCZ P662D.35 with hull 144WPP

Launch HIMARS (*Lockheed Martin Misseiles and Rockets*) caliber 227 mm rear viewod in the position of recharging of rockets container



HIMARS system ready for opening fire

Fig. 2. Examples transportations platforms for multiple launch rocket systems existing in Armed Forces of NATO Members

3. Missiles

Ammunition of fire module MLRS-P system should be used according to NATO standards. It should include submunition grenades, mines and guided projectiles guided on end of ballistic course.

For MLRS-P system it is planned training and field ammunition. Basic difference is additional ability of guiding of projectile on end course what increase accuracy of achieving target. On the contemporary phase of works on MLRS – P, it is possible only not guided training rocket.

Base on experience get on working on pocket of projects BM-21M system resulting in elaboration of „FENIKS" rocket, it is possible to start research on designing training rocket 227mm. Main parameters of projectile are presented in Table 1.

Tab. 1. Parameters of projectile

Subsystems	Projectile parameters	Engine parameters
Engine with composite fuel	Caliber - 227 mm	Caliber - 227 mm
Stabilization subsystem	Range at least - 60 km	Length - 2240 mm
Warhead	Max speed - 1200 m/s	Weight - 150 kg
Subsystem of correction of flight (for base missile)	Length of projectile - 4000 mm	Weigh of fuel - 114 kg
Automatically programmed detonator by SKO	Mass of rocket - 263 kg	Weight of corpse - 36 kg
Four part sabot guiding projectile through muzzle		Time of working - 7,2 s
		Impulse - 285 kNs

Construction of rocket's engine for training projectile will depend on many constrains included in technical assumptions. It regards assumed range and type of training warhead. Range of training rocket taking into account Polish shooting ranges does not have to be the same as in combat rocket.

After elaboration of preliminary construction of engine based on experiences and multinational cooperation agreements it is possible to specify elements which can be manufactured in our country.

Nowadays within Poland we do not have abilities of elaboration composite fuel to rocket's engine which guarantee achievement by projectile range of 60km. But it is possible to use fuel from „GRAD" engine under condition of significant correction of range.

Feasible to manufacture dimensions of pipe for body of rocket engine possible to acquisite in domestic conditions is presented on Figure 3.

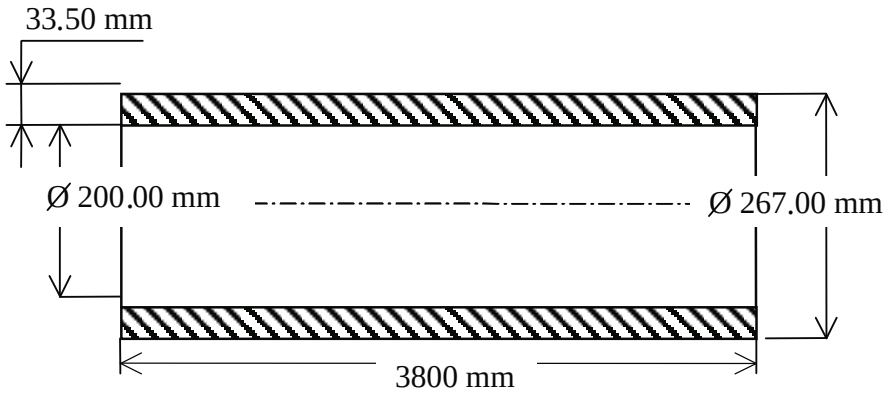


Fig. 3. Thickwall pipe for body of rocket engine calibre 227 mm

Fundamental problem connected with manufacturing of engine's body is fixing of body to the bottom. For previously made calibers BM-21M for instance rocket's engines caliber 122 mm all device was made as a one by using of plastic hot treatment method. Similar operation is possible to use in bigger calibers.

To conclude abilities of manufacturing of rocket's engine's body caliber 227 mm (not guided) it is worth to note that:

1. On Polish industry scene in years 1989-2009 were established many commercial companies which began to selling and production of military equipment. Great deal of all technology potential is created by several companies. Those companies developed its production abilities based on modern technology processes. During elaboration and putting of production of rocket we can use experiences and services of those companies.
2. Significant designing and technology experience of „BOLECHOWO" company indicate on great abilities for designing and production not guided rockets caliber 227 mm.
3. Rockets caliber 227 and 607 mm for MLRS-P system for guided system we should acquisite with cooperation with multinational companies, so it is worth to assume that great deal of subsystems should be made in Poland on the frame of offset.
4. During last time it was established great consortia with the goal of beginning Works on modernization rockets FENIKS to new fire module caliber 227mm what may be guarantee of acquisition of this rocket.

4. Logistics support subsystem

Logistics subsystem of fire module should contain:

- command vehicles (batteries and battalion's commanders);
- ammunition vehicles (transportation and loading ammunition to MLRS-P) - Figure 4;
- special vehicles of maintenance and evacuation - Figure 5;
- transportation vehicles - Figure 6.

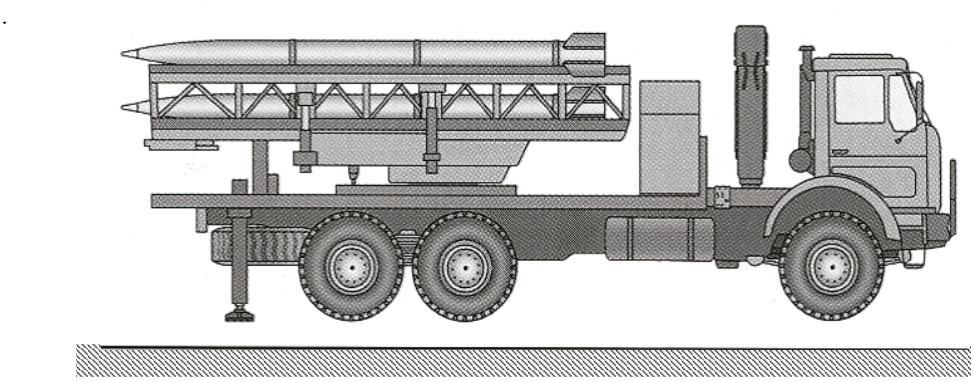


Fig. 4. Ammunition vehicle (transport and loading of MLRS-P rockets)

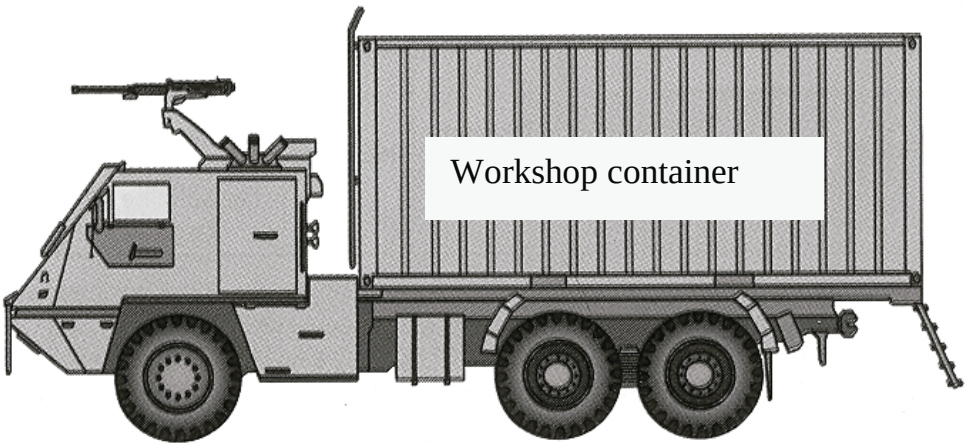


Fig. 5. Maintenance and evacuation vehicle

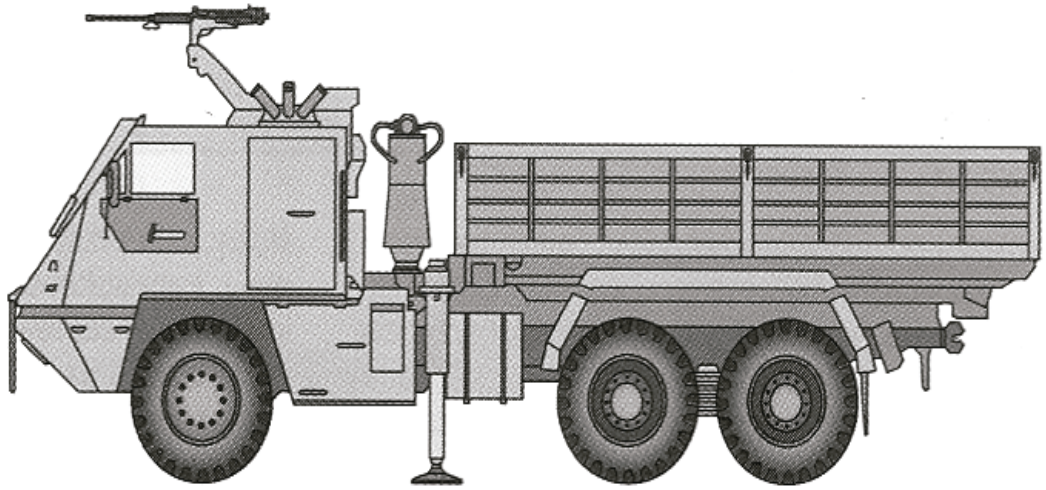


Fig. 6. Transportation vehicle

Ammunition vehicles should enable safety transportation full fire unit (inside container) with empty container unloading devices and optionally for loading full container to launch. Ammunition vehicle should be equipped with:

- positioning subsystem to set MLRS-P launch and ammunition vehicle on the same level;
- unloading system – to load full container and unload empty container (optionally).

Weight of container with rocket of respective rocket calliber should not exceed 10 000 tons, height with loaded container should not exceed 4,00 m, and width of container should not be bigger then 2,60 meters.

Special maintenance and evacuation vehicles should enable everyday maintenance and planned cycle services and technical conditions services, enable removing of exploitations deficiencies and safety crew transportation.

Transportation vehicles should be terrain-road vehicles with capability to curry rocket's containers of different rocket calibers.

Ammunition vehicles and special maintenance and evacuation should be road-terrain trucks JELCZ P662D.35 equipped with hull similar to launch MLRS-P, but shorter, with the same ballistic safety level, hermetic and equipped with ventilation, filters and air-condition.

From the analyses of transportation and maintenance needs of whole MLRS-P module results that all system can be elaborated base on domestic specialists and manufacturers ZS JELCZ and HUTA STALOWA WOLA Sp. z o.o.

4.1. Fire Control System – SKO

Autonomous automatic fire control system on launch should enable full service of launch work from specification of accuracy of standing place through supervising technical state all devices, horizontal positioning of launch platform, loading and unloading of containers with ammunition, calculation of target data, pointing and correction of date after each launch.

Autonomous system SKO on launch will fulfil following tasks:

- communication and information exchange with command vehicles;
- control of state of launches devices;
- supervising loading and unloading of containers;
- autonomous specification of place of standing;
- calculation of position data;
- ballistic calculations;
- aiming and correction of settings after each launch.

With autonomous SKO of launch cooperates programmer of ignitions. The task of ignition's programmer is simultaneous automatic programming of rocket's ignitions by launch's SKO. Between ignition's programmer and launch's SKO should be established twin directions communication and supervising as for programming of ignition's and in case or error of programmer fire will not be able to start.

SKO should fulfil requirements of C3 system, interoperability requirements with communication's and command's systems according to NATO standard.

SKO system on command's vehicles should enable multidirectional, digital and voice information exchanging, data transmission which enable correct command and control of subordinate units and cooperation with superior's level of command. In particular SKO will fulfil following tasks:

- communication, data exchange with superior commander's level;
- interoperability with NATO's command systems;
- graphic visualization of ready situation on screen;
- giving tasks to subordinate units or MLRS-P launches;
- positioning calculation;
- ballistic calculations and transmition to launches;
- storage of launch's work data.

To conclude it is worth to mention that experience of specialists from WITU during designing of SKO to BM-21M system gives guarantee to elaboration of similar system for MLRS-P fire module. What are more needed communication's devices for respective versions of SKO is possible to acquisite within domestic industry.

4.2. Command system

Command system should enable receiving information and commands by communication systems inside organizational structure from superior level as well as from technical reconnaissance, for example Brigade Commander's Group of Technical Reconnaissance. MLRS – P rocket system should cooperate with following elements of command's structure.

1. Vehicle of battery commander – enable voice communication and data exchange between launches and superior through wire and wireless communication. Wireless systems are UKF radios, computers – onboard computer with real time operation systems, wire communication systems – inside phone and digital connector. Additionally commander's vehicle should be equipped with GPS.

2. Vehicle of battalion's commander – should enable phone connection and data transition with launches and batteries commanders, vehicle of commands and fire control of battalion and superiors through radio and wire communication. Radio connections are UKF radiostations, information systems – onboard computer with real time operation system, wire communication systems – inside phone and digital connector. Additionally commander's vehicle should be equipped with GPS.

3. Command and control battalion's fire vehicle should enable voice communication and data transmission with battalion's commander, commanders and superiors through radio connection and wire connection. Base systems are UKF radios, radio line, information's systems – onboard computer with operational real time system and printer. Wire communication systems – inside phone and digital connector. Additionally commander's vehicle should be equipped with GPS. Base vehicle- chassis of command and control vehicle KTO.

To conclude it is worth to emphasize that proposed command system for MLRS-P system is modern and similar to command system of BM-21M which was elaborated by domestic producers.

Thus there is guarantee that whole command's structure of MLRS-P system is feasible to realization within domestic conditions.

5. Conclusion

In work it was attempted to analyze abilities of manufacturing fire module of MLRS-P system. From conducted analysis results:

1. There are abilities for elaboration great deal of subsystems MLRS - P module with using of existing research and development and domestic military industry capabilities.
2. Some difficulties can be caused by rocket system caliber 607 mm which require guiding during flight. Similar system can be obstacle for caliber 227mm. Those kinds of troubles may be overcome by possibilities of cooperation with R&D institutions and industry from other countries.
3. Nowadays we have domestic well experienced team of designers cooperated with well equipped industry which has proper technologies of production. Mentioned above team took their experience during designing and enforcing BM21-M rocket system. That experience is the best guarantee of realization its work according to assigned scientific task.