TECHNIQUES, TACTICS AND MODERN FIGHTING PROCEDURES AGAINST AGGRESSIVE BALLISTIC SYSTEMS

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Abstract: *Considering the great danger posed by ballistic missiles, lately the perception politico-military strategic defense has began to change, emphasizing on improvement of the missile defense weapons, especially rockets, considered the key to the future, especially in terms of accuracy striking and mobility. This article want to bring some information on techniques, tactics and procedures of modern combat systems against ballistic aggression, given the heightened concerns in ,, missile defense shield" construction.*

Keywords: *aggression ballistic systems, air defense fire systems; C4I2 systems; distributed network of employment; surveillance and early warning systems;*

1. INTRODUCTION

Mankind is facing new attempts in arms race escalating. Holders of ballistic missiles are interested in upgrading their own ballistic means seeking: increasing distance research, discover, control and air cosmic destruction means; increasing the number of nuclear load; efficient ways of deception regarding the objectives and real types of cargo; production new and more efficient means to combat ballistic potential of some opponents, capable to destroy any missile shield.

All those strategies are a response to the evolution of contemporary conflicts, which highlighted the defensive actions system and air defense protection measures to the detriment of offensive actions.

So, the SCUD missiles in the Gulf War were very late discovered, being combated in the final stage of the aggression because, installations, masking and specific operations training prior to rockets hindered quite a lot finding their fire positions and aviation indication to destroy them.

NATO deals with the issue of missile defense as an extended aspect of air defense, able to protect the ground forces, territory and population against short-range missiles.

By 2017 the alliance intends to achieve the capacity to protect deployed troops against short, medium and long-range ballistic missiles, by intercepting them on the initial, middle and final trajectory[1].

This intention translates into practice through: developing theater missile defense capabilities to protect troops wherever carried out against short, medium and long-range ballistic missiles; examining options to protect forces, territory and populations against the full range of missile and NATO - Russia Council activities to support future defense operations during crisis response missions.

NATO defense architecture for future missile is likely to include defense on two levels, upper and lower. The lower level provides protection against aircraft, cruise missiles and ballistic missiles with range below 1,000 km.

The upper level would protect NATO forces against ballistic missiles with longer range.

Hopefully this system on two levels is to ensure a rate of leaks (percentage ends combat penetrating defense) below 1% and meet the following four missions: detection of the missile, tracking the rocket in flight, identification of real missile of false targets and destruction the attacking missiles.

1 Hans Rosjorde, *Missile Defence and Other Challenges to Alliance Unity*, „Air Force Magazine", October 2001.

Ballistic missile threats have not immutable nature, possibly being redefined in time, according to international political-military developments which would lead to the redefinition of architecture and emergencies in the MD system. By redefining the level of protection against ballistic missiles (lowering the level of ambition) can achieve substantial reductions of MD system components (by taking into account only mobile interception system) and the necessary funds for their development.

2. Tactics, techniques and practical means to combat aggressive ballistic systems

Specialized literature provides, as practical means to defense against ballistic missile, following types of actions: defensive actions, attacks, protection and C4I measures. Depending on the situation, we can consider that the success in missile defense operations lies in flexibility, integration and synchronization of air defense fire systems.

Offensive actions were designed to destroy and neutralize ballistic missiles before, during and immediately after launch. The purpose of offensive actions is not limited to destroying launchers but also to prevent the firing of rockets by the adversary.

Manners to achieve this purpose are: hitting the infrastructure of ballistic missile, attack the network communications equipment necessary to limit movement of the haul; attacking critical points under the temporary aspect (launchers, fueling vehicles or other targets within them); an increased rate of operations.

Success in operations must use offensive actions counter-infrastructure, counter - mobility, against critical targets and rhythm control in an integrated manner.

The integration of special forces, intelligence, surveillance and research, artillery and air defense missiles, aviation, helicopters and missiles land (together with other means) requires improving command relations, the development of common doctrine and interoperability of C4I system.

The American concept called "Ring of Fire" summarizes how a network can be created to tackle high mobility targets such as missile launchers. For example, a sensor, in a sensor network, discovers and identifies a launch system. This information goes to a distribution network controlled by an algorithm by which each target is assigned to a gun and missions are sent to fire units. If we request a confirmation from other sensors or if it there are no available weapons, the same algorithm can direct another sensor to the same target. The algorithm in response to information procured, performed the best distribution of weapons and sensors for considered targets. Target data with action orders are sent directly to the shooters and attacks operators launching. Distribution algorithm must consider the target priority, weapons available, the degree of target identification, likelihood of success, the risk factors

American analysts have concluded that the efficient use of "Ring of Fire" concept implies substantial changes in doctrine, command and control processes and technology. Switching from a general view to one based on building control algorithms and determines the extent and location of human interface requires new levels of joint action. But for offensive actions to be successful these changes are absolutely necessary.

Through air combat actions are destroyed enemy air assets and / or missiles in flight. As the missile speed is higher, the area where it can be combated and the probability of interception are lower. For short-range ballistic missiles, short flight duration does not allow the defense system to discover and destroy the missile before impact. In case of medium and large-range air defense missiles rarely there will be enough time for a classic engagement putting necessary corrections. Ammunition must be launched as quickly as technology allows. Even when integrating a system with shorter range, speed ballistic missiles may not allow evaluating the results before taking the decision to use short-range system. In this way an overlay coating provides better protection, but with higher consumption of ammunition.

Targets selection or calculation of air combat vectors is technically difficult and affects directly the endowment. The need for selection comes not only as a result of deception or passive jamming, but also as a result of phenomena related to launching (eg separation of rocket stages). Ideally it would be launched one interceptor related to one air combat vector. Missing data can lead to the use of multiple interceptors for a poorly discovered target.

Air defense missile systems designed to intercept extra-atmospheric means will allow interception in the ascending and median trajectory of missiles. The difficulty lies in limited possibilities to act in several areas simultaneously. While the area where ballistic missiles are launched expands, the system must withdraw to defended area, reducing and sometimes eliminating the possibility of interception on missile upward trajectory, thereby reducing defended area. Similarly, the need to use two or more missiles is tactically safe, but is lowering the possibility to defend a larger area. In areas where the launch points are more disperse the effect on defense is dramatic. Targets selection remains a difficult issue.

Air defense missile systems are expensive and must cover large areas. While combating ballistic missiles in the first two phases is the mission of military satellites networks using lasers in this moment, combating ballistic missiles in the final phase (rocket re-entered the atmosphere with a speed of 4000 km/h.) is the field of air defense missile systems.

Significant steps have been made in the development of air defense missile systems capable to combat effectively the threat of ballistic missiles. In small panoply of such achievements are distinguished American air defense system PATRIOT series, Israeli air defense system Arrow and Russian S -300 and S-400 series. By including ballistic missiles systems among probable targets of air defense rockets was extended the use of missiles with high initial speeds, with engines solid fuel, which does not require any large initial time-consuming process in technical subunits and does not require an initial cycle of preparing on the launch pad, thus reducing the firing cycle as the first way to increase nominal firing capacity of air defense missile systems.

Another way to increase the nominal firing capacity was increasing the number of channels for targets, currently leading to S-300-PMU complex with 24 channels for aerodynamic targets and 16 channels for ballistic targets.

Air defense protection represents those measures taken to put our own forces in a less vulnerable posture and to reduce the effects of ballistic missiles actions.

However, for the foreseeable future it remains essential. Protection is achieved not only through early warning when the offensive and air defense actions fail but also through the measures taken before the launch or even before starting the campaign. Protection efficiency results from understanding that no defense system is perfect; some objectives (troops, areas) will remain unprotected; launches will occur; some will penetrate the defense, where it was organized.

Where total avoidance is the preferred option to attack, early warning and masking are still important. Avoiding attack can be achieved by deceiving the enemy (deception and concealment), using effective air defense actions or by an appropriate outflows speed to prohibit releases. This involves knowledge of the situation, possibilities and limitations of missile defense system by commanders and troops.

If the forces acknowledge the limitations of other solutions, they can reduce the probability of an incoming attack or the destructive effect of a possible attack by protective measures. Ideally, each unit should know his weaknesses and be able to take appropriate countermeasures, and every commander should know the threats for its subordinates and must be able to share it in time to decision makers. This implies the existence of a network whose results could be used to influence leadership in offensive actions or deployment of air defense forces. The command, control, communications, cooperation, information and informatics system is designed to ensure management in actions through real-time situational awareness, decision-making and its transmission, coordination and capabilities integration of joint forces.

In order to succeed in the struggle with ballistic missiles, the commander must have a conception of action flexible, dynamic, integrated and technical means to transpose this vision into practice.

The concept of action and C4I architecture capabilities must be dynamic enough to recognize the uncertainties of war. A rigid doctrine or based only on technical capabilities will not allow the operational forces commander to adapt circumstances. Concept must be dynamic enough and to be able to acknowledge the changes in rhythm, targets selection and areas defended. Integration does not simply refer to the systems interoperability but especially to effects integration. This assumes that a small number of air interceptors, affects the rhythm of attacks and protection measures. It is also the recognition that the movement of an infantry company and the arrival of a transport or supply affect to some extent the struggle with ballistic missiles. Such changes occur in few minutes, and any concept or plan must have an organizational and technical level of integration that will enable it to adapt accordingly. Air defense actions are carried out following a dynamic planning process that should establish what districts (objective troops) must be protected, in what means and how.

A network type solution, including the ability to conduct coordinated actions and employments increases the number of options and efficiency. In general, using a large portion of the electromagnetic spectrum complicates countermeasures but increases the precision and flexibility. Sensors network (radar, infrared or other) may provide a more consistent aerial image and can assist target selection and identification. A coordinated engagement capability consists in overlapping areas of employment, layering forces leadership, in targets assessment and sending new missions. This integration optimizes the use of weapons and ammunition consumption in a scenario based on networking, launching a ballistic missile is initially detected by satellites (via infrared sensors) or radar.

In a distributed network the launch is also reported by other sensors. For radars this signal allows limiting the initial research area. In a single network unit entered data are accurately determined. Single network has the advantage of differentiation the frequencies while sensors have the advantage of different aspect for radar charts. Accurate information regarding sites of site of the launching installation, the launch time and impact point are sent to all units. A distribution algorithm take into consideration the interception trajectory, speed, resistance to countermeasures and available weapons, to calculate the probability of destruction and the most appropriate means of interception. One or more air defense missile units receive by operation order recommended number of missiles to launch on the target, interception height and other information. Combat collateral damages, missing the target or another release order require changing the action orders.

An engagement network as described bellowed require technical and doctrinal fully integrated solutions, based on a unique vision upon the fight. This level of coordination and integration of forces is necessary to avoid their schematic use with huge material consumptions, by dividing the area of operations in sectors or arbitrary division of responsibilities in certain periods of time.

Ballistic missiles can be countered before launching, immediately after the launch, on the intermediate flight course or in the terminal flight phase. The issue of combating ballistic missiles before launch is very complicated but not impossible. It is known that Barbarosa plan, the attack planned by Germany in Russia which was implemented in June 1941, was on the Stalin table in December 1940. Today, information sources, multiple and placed in all environments, can provide necessary information to combat ballistic missiles before launch. A problem remains the legitimacy of the attack before launching.

Defending the ballistic missiles in their initial phase has several advantages: the rocket travels at relatively low speed and has a large mark in infrared gamma; missile can be attacked as a unitary target before launching their sub munitions (multiple battle heads)

and electronic traps; target parts as results of hitting falls, usually in the area occupied by the enemy; provides defends for largest areas with the lowest number of means. In order to engage ballistic missiles in this stage is necessary to meet the following requirements: very low reaction time, safe decisions and multiple possibilities of approaching the fight (diverse range of combat capabilities). The development of opportunities struggling with high power lasers and systems for rapid interception decreases enemies "chances of success" and achieve viable systems arranged in space.

Currently are assessed many defense concepts by intercepting ballistic missiles in the first part of their trajectory. Some of the concepts under study are based on high-energy laser weapons; others are kinetic energy weapons systems. Laser weapons will be disposed on satellites, on large planes, airborne laser will be installed on Boeing 747 or on robot - aircraft (the Boeing plane CONDOR). Weapons systems with high kinetic energy are considering the use of "vehicles of destruction" (missiles) with high kinetic energy, ground-launched and sea-launched, which will destroy ballistic missile by collision.

Air Force antiballistic program based on airborne laser (ABL) has focused on short and medium range ballistic missiles.

There are settled clearly defined stages for the preparation of ABL and conducting of certain strategic defense missions. With sensors disposed on board each aircraft equipped with ABL will run out long range surveillance missions over large areas where enemy missiles could be launched.

The short term activity, concerning ABL will focus on actions taken on the ground to develop and demonstrate the technologies components and subsystems required for an operational laser disposed in space and to design and put in place an experimental integrated aircraft, scheduled to be tested in space. ABL project is based on long experience in the field and on reducing the technical risk as quickly as possible in the design process.

Ballistic missile defense on the medium part of the trajectory (MDS) is the most targeted field for the future.

On medium section of ballistic missiles flight trajectory, are achieved more reliable ways of counteracting them.

MDS program is divided into multiple elements, which include ground/sea based systems, operating on the part medium part of trajectory. This succeeds the national missile defense program (BMD) and enlarged marine forces program related to combat actions. In accordance with previous BMD program, is now developed a single system that can run interception on medium trajectory section in order to counter ICBMs - *The national missile defense program*.

Given the spatial scale of ballistic missiles fight on their medium trajectory, the rules of engagement exceeds the national framework, some becoming international, and more than that, involving countries outside NATO.

Details regarding the rules of engagement of ballistic missiles on their medium course and the consequences of their total or partial destruction are not shown in this study due to limited access to specific information related to interception systems.

The optimal ways of sensors arrangement for early warning, fire control and sensor interceptor missile on the medium course started with the assumption, as a result of political consultations that will not result in limitations / impediments of the Nations location.

Any such limitations, leading to an increased number of positions and their redistribution as a whole, in order to reach the level of ambition on populations and territory defense.

Within the study, Romania is taken into account for early warning sensors location and for interception sensors of missile on the medium trajectories. Location of launching interception systems is planned for the first phase, the initial operational capability (IOC).

Defending the ballistic missiles in the terminal phase of its flight (TDS) is really the area where we can include air defense. TDS allocates resources to support the establishment and modernization of defense capabilities designed in the fight for the destruction of ballistic missiles in the terminal phase of their trajectory.

TDS main projects aimed THAAD system (defending zones at great heights in combat actions) and program for achieving Israeli Arrow system.

THAAD program, with the participation of France too, represents the tactical connection between extra atmospheric weapons and air defense points. Extra atmospheric weapons include cosmic and ground missiles. Missile defense points include PATRIOT rockets and new ERINT (Extended Range Interceptor). THAAD missile system composition will have a range of l50-200 km, a ceiling of l50 km and fly at the speed of 1500-2000 m/s. Will be almost certain the use of missiles which destroy targets through direct impact, making them, thus lighter by removing combat load.

4. CONCLUSIONS

From the research concerning the development of missile defense systems consider at least the following conclusions:

- the solution of implementing a missile defense system, military advanced and economically acceptable, is based on the system of measures on strengthening the architecture of intimidation zonal concept promoted by the US, based on the evolution of threats area that spreads from Iran, Syria and North Korea, threats that cannot be countered only by „armoring" international democratic environment ballistic systems, ie,, missile shields"

- worldwide, there is an inflation of missile shields; missile shield is currently the only mean (for now) with which we can defend against ballistic missile attacks carried out by any type, from the short to intercontinental action range, carrying nuclear, chemical or bacteriological loads; it should not be excluded that Russia is preoccupied with promoting new technologies concerning production of missile systems, having with certainty achievements in the field of missile shields; The future missiles designed to destruct ballistic rockets will have equipment based on proximity warheads and auto routing heads whose operation will be within the principles: radar, laser, termovision. There is a trend to reduce the missile size to solve the problem of radar mark and to increase their maneuverability.

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