CURRENT ISSUES CONCERNING THE WORKFLOW IN THE MILITARY ENVIRONMENT

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Abstract: *The radical transformation of the human society under the impact of the unprecedented evolution of the technological informational environment has profoundly influenced the military action, in a broad spectrum. The military specialists identified certain solutions to the problems generated by the complexity of the battlefield which were mainly focused on importing technologized models from other related domains such as economy, engineering and social sciences, mainly from the competitive environments. Currently the workflow is perhaps one of the best solutions that can support the management of complex structures, functions, tasks, alerts, reports, notifications, tasks lists, etc. continuously changing under the permanent influence of external and internal factors, based on predetermined and self-improvable algorithms and processes.*

Key words: *operational environment, land forces, workflow, operative air defense monopost.*

1. INTRODUCTION

The economic field, from a historical and conceptual perspective, can be characterized by excellence as one of the oldest and realistic spaces of confrontation.

Contextually, the deep changes in such a competitive environment may interact directly or indirectly with other different or similar systems, such as the socio-economic, the security, and so on.

Not a few times has the inspiration of the economic models transformed the look and the behavior of military structures by differentiated approach and new attitudes, as products specific to the conflict space, namely the theaters of operations.

The efficient use of the resources and the maximization of the profit transformed the economic organizations into agents specialized to adopt the most appropriate models supported by innovative cybernetic information systems.

The partial understanding of "the mechanism" and the principles underlying the economic interactions between the established structures, resulted in a conceptual approach and in the merge of concepts of descriptive potential of facts specific to a certain military conflict.

The increase of the complexity of the military operational environment determined natural reactions for identifying and implementing certain force management methods and efficiently applying the fighting potential at one point in the armed confrontation space.

Land forces, through their specific tasks, can be characterized by spatial, temporal and operational elements, which require increased and effective multidimensional protection. In this sense, for an integrated formulation of the response options, we highlight the systemic approach to planning military action with the organization, coordination and control of the activities in space and time.

Command and control of the military actions specific to the environment of operation in depth, at contact and in the back, and also the selection of forces on the main direction of effort, on the other direction, in direct support to the main effort and the reserve can be integrated to the concept of systemic approach in order to achieve efficiency.

Relevant to the assertion we made is that the distribution of the fighting power and emphasizing the interaction with the combat environment, especially with the particularities of the enemy's actions. The dual nature of the land forces operations in the physical space on land and in the air, makes us formulate different assumptions on researching the behavior of the specialized structures on confrontation environments.

Thus, we selected as representative behavioral study subject of the land forces the air defence missiles and artillery structures. Rephrased, the mission of every air defence fire system is fighting the air enemy for defending and ensuring the freedom of movement of the troops and assets of combined tactical task forces, where they are deployed / operate; uninterrupted for the entire duration of their mission, both day and night, in all weather conditions.

The research of the rephrased mission of the air defence missiles and artillery structures shows the multiple character of the air defence actions in at least three respects: the air enemy, the objective which has to be air defended and the confrontation environment. If it is relatively simple to interpret the factor of the air defence actions resulted in the air defendable objective by layout, directions and nature of its defensive or offensive operations, the temporality of its actions, not as easy is approaching the air enemy and of course applying the specific environmental conditions. The character of the air enemy's actions in relation to the combat possibilities of the air defence missiles and artillery structures sizes the dimension of the air space of responsibility depending on the tactical and technical characteristics of the air defence systems as shown in fig.01 below.

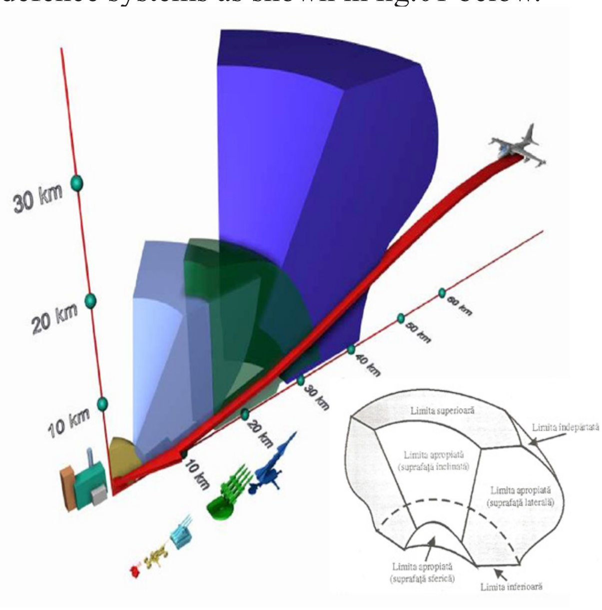

Fig. 01 Tabular representation of the airspace of responsibility according to the specifications of the supplied air defence missile or artillery systems.

The capability of the air defence actions specific to the land forces is given by the implications of the relief, namely the coverage angles which lead to a physical reduction of the airspace of responsibility. We show that this reduction affected by the terrain is not specific to the actions of the air enemy or not to the same extent. In order to identify, at least from this point of view, solutions to mitigate the influence of the terrain, we resorted to the implementation of the six rules of deploying the air defence missiles and artillery troops and assets, as follows: mutual support, balanced air defence fires on directions and in depth, overlapping fires, weighted coverage, early engagement, defense in depth.

Fulfilling the conditions for reaching the aspirations generated by the landforms specific to the deployment area, are limiting and with no prospects of strengthening the fight with the air enemy, from our point of view. Therefore, we turned our attention to understanding the air defence phenomenon and identifying the relationships that can be established between two or more air defence systems.

We observed the sequential nature of fighting the air enemy on distinct phases: reconnaissance of the airspace (to the maximum limit of radar, optical, etc tracking, associated with the terrain possibilities), discovery and identification of the aircraft's affiliation, aircraft classification, continuous tracking of the air target, combat and destruction of the target (conducting the actual air defence firing), ratification of the effect on target and resumption of the action, if required. A second observation is that regarding the original way of achieving combat sequences with the air enemy of different air defence systems. Whatever air defence system we would discuss, it performs the same typology of target engagement and thus operates with the same basics: the direct distance to the target, the size of the elevation and azimuth angles (angular velocities), the target velocity and its flight height, they are all measurements relative to a single reference system: the axle of the fighting machine, the middle of the battery firing position, the command post (the radiolocation station) of the battalion, namely of the air defence missile and artillery regiment. Whichever analyzed structure we take into consideration, they are all characterized by an individual unique system of reference which describes the interaction with the aerial target. To facilitate our approach, we defined the notion of *operative air defence monopost,* namely that air defence reaction system capable of fulfilling autonomously all the phases and sub-phases of the *air defence workflow* from that of reconnaissance of the airspace to that of destruction of the aerial target.

Involving the limitative nature of the air defence workflow from the tabulated values due to the terrain features, the angles of coverage generated by the dynamics of the actions of the land forces (the objective which needs to be air defended) raised the question whether it is possible to adopt the principle of *single frame of reference* (forward edge of the battle area, center of the firing position, etc.) and „bringing" the air defence systems from the state „of fighting in collaboration with..." to the state of „performing the air defence collaborative workflow together with...".

Basically, the innovative idea is to deliberately or conditionally engage the air defence monoposts on each phase and sub-phase of the air defence collaborative workflow (certain constraints regarding the electromagnetic emissions and so on) when they have maximum efficiency, fire power and protection. We emphasize the sequential character of each operational air defence monopost, in other words it can take part only in certain sequences which can be coherent or alternating, which is possible due to a *air defence collaborative platform*.

We justify the reasoning of the air defence collaborative platform by the fact that for establishing the air defence workflow, the radar stations transmit the actual coordinates of the target to the firing channels. The data transmission time, related to the speed of the target creates difficulties for the air defence firing in terms of decreasing the firing areas or the forward edges of the battle areas (fig.01) and approaching the aerial target to the parameter of the critical path of the weapon system. Calculating the time elapsed since the acquisition of the aerial target by the radar station is different for a different radar station or firing channel if we work in cooperation and it can be the same efficient time if we work in collaboration. Basically, by extrapolating the position data (deployment in the terrain) of the components of the air defence system in the two variants, we observe a significant time gain in terms of tens of seconds or even full minutes, which means an effective increase of the fire zone / launch area.

The above statements are supported by applying the following formula.

$$d_{desc} = d_{î} + V_{ȚA} * (t_{zî} + t_{p}) \quad (1)$$

and

$$D^{2}_{desc} = H^{2}_{ȚA} + (d_{î} + V_{ȚA} * (t_{zî} + t_{p}))^{2} , \quad (2)$$

where:

- d_{desc} – the necessary horizontal acquisition distance;
- $d_{î}$ – the horizontal distance to the forward edge of the battle area;
- $V_{ȚA}$ – the aerial target's speed of operation;
- $t_{zî}$ – the flight time to the meeting point of the projectile/ missile and the target;
- t_{p} – the necessary time to prepare for firing;
- D_{desc} – required inclined tracking distance;
- $H_{ȚA}$ – flying height of the air target.

Most often, military planners of air defence operations work with tabular data specific to the air defence missile or artillery systems and omit the essential meanings of the cooperative working relationships or collaborative workflow.

Another aspect is the precision and accuracy of the data, of the informational collaborative workflow (fig.02) regarding the situation of the aerial area of responsibility of the land forces and covering a wider range of heights where the aerial targets can operate.

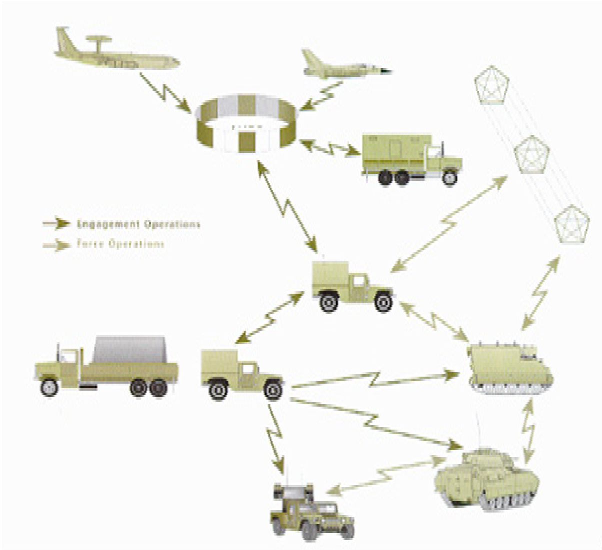

Fig. 02 A functional variant in the "intelligence" section, of the air defence collaborative workflow.

The variant we suggest for the collaborative workflow of the air defence systems of the land forces may be one of the best and necessary responses in terms of effectiveness of the air defense artillery systems in the army is currently equipped with.

Only the development of a collaborative platform for managing the airspace would be the most appropriate means of achieving a viable security of the area of responsibility, linked with technical and tactical capabilities of those connected to such a platform.

This suggested variant takes into account the capabilities of all elements acting on the airspace, from all categories of forces (air, land and naval), they are basically all the beneficiaries of the sum of actions and security efforts in the air.

By comparison, we could compare the air defence collaborative workflow with network warfare, but it goes beyond it exactly by the distribution of the power of decision and control to all the elements integrated into the network.

The advantages of this practical air defence collaborative work method are the following: the reconnaissance, acquisition and tracking of the passive target is performed in secret without the target's discovery of the air defence engagement, thus achieving the element of surprise, firing from concealed positions or even while on the move; the very short reaction time from the moment of acquiring the target; achieving an economic and efficient volume of air defence fire; achieving greater freedom of movement in the tactical field by undertaking the optical tracking by other air defence collaborative workflow users; the accuracy and the speed in determining the firing elements, etc.

Concerning the disadvantages of this method, we could mention there practically are none, as long as at least two entities in the air defence collaborative workflow network simultaneously track the target, any user logged on to the functional platform (reliable radio connections, GPS) can fire on that target under maximum protection and safety conditions. By extrapolation, we can extend the method of air defence collaborative workflow method to a number of N targets which form a real ”on-line” air image recognized by any user logged on to the platform.

In the future, we intend in our approach to theorize the air defence collaborative models to come up with argumentative mathematical justifications and to fulfill one of the wishes of the national air defence system from the land forces, namely the interoperability of the air defence missile and artillery systems of the current endowment in a practical manner.

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