

Conceptual Model of Port Security Simulating Complex (Bulgarian Standpoint)

B. Mednikarov & N. Stoyanov

N.Y. Vaptsarov Naval Academy, Varna, Bulgaria

K. Kalinov

G.S. Rakovski Defence and Staff College, Sofia, Bulgaria

ABSTRACT: Using modeling and simulations has established itself as the most effective approach of preparing personnel engaged with crisis management, including the training of port security responsible personnel. On the background of presenting the overall methodology of transforming Bulgarian Harbour Protection System, the paper formulates a set of requirements for port security related education and training and proposes a general model of a simulating complex supporting the education and training process.

1 INTRODUCTION

There is no doubt that modeling and simulations (M&S) has no alternative in the modern education and training (E&T). The port security E&T is not an exception.

The process of elaborating a conceptual model of port security simulating complex in Bulgaria coincides with the process of transforming the Harbour Protection System (HPS). In addition to the concomitant problems, this coincidence causes a positive opportunity – to avoid adjustment of an existing simulating system to a new HPS realization and to elaborate a M&S complex simultaneously with the that is to be modelled.

2 BULGARIAN PORT SECURITY SYSTEM:

When elaborating a variant for optimization of the Bulgarian HPS, we took into account two types of considerations.

The first group, named “*scientific considerations*”, is a direct result of the theoretical analysis of the security systems as a particular class of organizations and the application of the “*mission approach*” for functional analysis to the Bulgarian MSS performance.

The second group of considerations, named “*an accomplished facts or facts of life*”, is a result of studying the Bulgarian MSS current status.

The summary of so called “*scientific considerations*” is:

- 1 The HPS is to possess greater “informational capacity” than the opposing organizations do.
- 2 The HPS is to function permanently and to be able maintain a regime, adequate to the level of threats. Said in other words, to increase or decrease its functional parameters in the context of scale of the threat.
- 3 The HPS is to be predominantly “*object oriented*” than “*zonal oriented*”.
- 4 The HPS is to be granted a relatively high level of autonomy, but the autonomy has to be balanced with reliable control.
- 5 The HPS is to be able to achieve flexible satisfaction of the management principles in a dynamic environment. Said in other words, the HPS has to maintain correct balance between relatively contradictory principles in the context of the situation.

One more “*scientific consideration*” should be mentioned. It comes for comprehension that, during the passage of a ship to/from the port area, the responsibility for her protection will be granted to the Navy. On the other hand, the responsibility for protection of the cargo during its delivery to/from the port will be granted to the Ministry of Interior. In both cases, the responsible institutions will be capable to minimize the risk of terrorist attacks by choosing more safety roots for passage and/or providing reliable protection measures in a typical environment of operating. The problem, which arises, is related to the fact that the transfer of the responsibility for cargo protection will be done in place and time when the cargo is most vulnerable – in the area of the port.

The following consideration is to be added:

6 The HPS is to compensate the shortcomings of the existing system, by providing adequate protection of ships and cargoes in the most vulnerable area: littoral approaches to the harbour, port area and adjacent urban area on shore.

On the base of the Bulgarian MSS current status, the following consideration has been formulated: The optimization of the HPS is to consider the current organization of the system. In other words, the process of optimization should not involve the idea of dramatic redefinition of the existing organization of the HPS or a new subordination of resources. The optimization has to focus mainly on the opportunity for improvement of the HPS functioning by achievement of a synergy effect of shared efforts on the base of correct co-operation. Practical recommendations are:

7 The HPS is to be in full compliance with the European, national, and international legislation.

8 The HPS is to consider existing “*status quo*” of the organizations involved (and interested) in harbour protection. The minimal changes of the “*status quo*” are recommended.

9 The optimization of the HPS has to provide correct solution of the organizational “*command and control dilemma*”.

Taking into account that to a great extent the problems of the Bulgarian MSS current status are result of a situational approach to problems and the existence (and establishment) of too many interacting organizations, one more consideration should be added:

10 When optimizing the HPS, we should not establish one more organization, but unite the existing bodies (or their representatives) in a system.

On the base of the defined considerations, we elaborated a concept for optimization of the existing HPS. The leading idea of the concept is to achieve a viable HPS that, on the one hand, possess “*informational superiority*” to the possible threats (especially – the terrorism), and on the other - to satisfy management principles in accordance of the situation.

Both aspects of the concept are realized by establishment of network-organized HPS, which in a conflict situation is centralized on a level immediately above the scale of the terrorist threat

The system is organized on the base of the existing network of Port Security Councils, established by the Bulgarian government *Ordinance No 53/2005* in response to the requirements posed by *ISPS Code*. [3]

The *Ordinance No 53* [7] establishes three security levels of readiness of the HPS. During the first level of readiness (the lower one) the system is maintained by the Port Security Councils mentioned above. When a higher degree of readiness is reported, the Councils are strengthened with additional assets (from the Ministry of the interior and the Navy). In the context of the situation and in accordance with a procedure, a senior person in the council is nominated (a chairman of the council) The nominated chairman is granted the right to exercise authority over the forces (assets) placed under command. The process of delegation of the command authority and the extent of the delegated authority are settled by a procedure.

In fact, the process described is the realization of the idea of centralization of a network organized HPS on a level immediately above the scale of the threat.

The technical base of the “new-born” centralized system is carried by a naval unit.

The area of responsibility of the system includes: littoral approaches to the harbour, port area and adjacent urban area on shore.

The components of the HPS are in fact joint forces belonging to different institutions and organizations. As we can see they provide “*object oriented*” protection. The “*zonal*” aspect of the protections remains a responsibility of the state institutions. Every institution exercises it in its particular area and/or functional direction of responsibility.

The “*command and control dilemma*” is settled by, on the one hand, a procedure for nominating of a senior person in the Harbour Protection Council, and on the other - a procedure which regulates the transfer of authority over the HMS (or a part of its components) among different bodies.

The results of the negative factors “*life-cycle*” analysis serve as a base for formulating the indicators that “*switch*” the levels of the readiness of the system and the transfer of the authority over the whole HPS (or a part of its components).

3 PROBLEMATIC FIELDS OF HARBOUR PROTECTION SYSTEM EDUCATION AND TRAINING:

The current harbour safety and security related E&T process suffers the following practical problems:

- ship officers have little knowledge of the whole maritime safety and security system, whose functioning has become significantly more important in the light of the ISM [2] and the ISPS Code. Very often, the lack of this knowledge leads to

demotivation of the main participants in the process of maritime transport;

- the training pursuant to the ISPS Code relies on the acquisition of standard tactical and technical methods of protection, which provides general standard basic knowledge and skills. Even though this is necessary, it contradicts the idea of proactiveness and creative problem solving;
- the increased requirements of the STCW Convention, which already cover all the categories of maritime transportation system security officers, now demand a new system of training and a suitable learning environment;
- developing and maintaining such an environment requires significant expenses and the employment of a very well-prepared team, which is beyond the affordable for a maritime training institution.
- These problems are hyperbolized by some contradictions in the computer-assisted E&T process:
 - developing and maintaining an expensive and complex environment for computer-assisted E&T is not affordable for a maritime training institution;
 - the training in the issues of security should not be closed up only within the framework of the merchant marine;
 - the future maritime officer should receive a much broader range of training in the issues of safety and security than the minimum required one in order to be an active organizer and an adaptive participant in the processes occurring in the World Ocean;
 - the total time for training of the future maritime officers is reduced, and because of this the necessary balance must be stricken in their fundamental training in safety and security, and a new level of knowledge and skills must be achieved by applying both traditional and new training techniques.

These issues are practically a direct result of the lack of common methodology for preparing and conducting computerized training related to the general subject area of maritime security and harbour safety in particular.

4 FORMULATING REQUIREMENTS FOR PORT SECURITY SIMULATING COMPLEX:

This part of the article describes overall logic underlying in the process of harbour responsible personnel E&T. It reflects two dominant concepts:

- 1 The E&T process serves the function of system adaptation (Lynch J. 1937).
- 2 Despite being a process of setting and maintaining desired behavior; the management process is based on reactions.

Notwithstanding that both concepts overlap, they pose some distinguishable requirements. In this context, some additional explanations are necessary.

Assuming that education is a process of adaptation, we have to take under consideration that “*adaptation takes place on at least three different levels*” (Gell–Mann 1994). On this base, we have defined three levels of the system adaptiveness: short-term adaptiveness, long-term adaptiveness, and evolutionary adaptiveness.

The short-term adaptiveness is a process of adaptation to the current situation. It is therefore a process of direct and situationally-oriented adaptation. It is performed predominantly by the way of functional adjustment. The process of functional adjustment very often is held by selection of a functional model (schema) that is relevant to the situation recognized.

The long term adaptiveness is a process of adaptation to relatively predictable future conditions of the environment. In addition to the functional adjustment, it is performed by the elaboration of structural prerequisites for functional adjustment to possible future situations. The practical execution of this process usually includes: making prognoses; analysis of possible situations; and elaboration of adequate reactions.

The evolutionary adaptiveness is observed in unpredictable situations. It is therefore performed by elaboration of structural prerequisites for the necessary system’s properties for adaptation in cases of emergency.

It is a good idea to make a parallel between, on the one hand, the three levels of adaptation, and on the other – the three levels of management (tactical, operational and strategic). Going one step further, we can state to a great extent of certainty that the E&T process has to provide prerequisites for the three types of adaptiveness.

Assuming that the harbour protection management process is based on reactions, the scopes of different types of management can be summarized as follows:

- 1 Strategic management is to achieve better alignment of organizational policies in response, in a long-term time scale, to changes in the external environment and in the organization itself (the internal environment).
- 2 Operational management is the process of designing, executing, and controlling an organization's operations that convert its resources into desired end-state, and implement a selected strategy. This type of management responds in a relatively short-term time scale to predictable changes in the external environment.

3 Tactical management is the process of quick and accurate assessment of the situation and elaboration of an appropriate response.

The particularity of the three levels of management advocates the necessity of three distinguishable types of E&T.

Considering on the one hand, the comprehension that one's reactions to a particular situation are an original "*cocktail*" of previous experience and the ability to estimate and respond to the particularity of the situation, and on the other – the parallel between levels of adaptiveness and levels of management, we can formulate the focuses of the different levels of E&T process.

The initial E&T process (tactical) has to establish behavioural models necessary for quick response to a familiar situation. In other words, the purpose is to give the trainee an adequate "memory". For this reason, the basic level of the port security simulating complex has to provide models of typical situations in typical environments.

The next stage of E&T process (operational) is to make the trainee to "*overcome*" the framework of the behavioural models learned, to "*recognize*" the specificity of the situation, and to elaborate proper (which means – specific) response. In order to support this idea, the port security simulating complex has to provide models of non-routine situations in non-routine environments.

The last level of the E&T process (strategic) explores the idea to give the trainee the ability to make logical relations in an "unrelated" processes and events, to recognize the patterns that they have in common and "*cause - effect*" relations, and on this base, to elaborate basic and widely applicable behavioural models.

Taking into account that computer-assisted E&T basically provides simulations which model the conditions of performing system functioning, obviously, simulators have to be flexible enough in order to be able to "*shift*" the accents of the overall E&T process.

This understanding of port security E&T process is the base for formulating the following requirements to the overall M&S system:

- 1 The virtual environment for the HPS's E&T process has to provide both "*technical experience*" and "*management practice*" for the personnel. The "*sub-recommendations*" are:
 - the simulators have, on the one hand, to be in full compliance with the equipment, and on the other – to "*reflect*" the existing organization of the HPS;
 - both the simulators and the M&S methodology are to be flexible enough in order to "*shift the*

emphasis" of the training from "*predominantly technically oriented*" to the "*predominantly management-oriented*".

2 The virtual environment for the HPS's E&T process has to model a great variety of possible safety and security situations.

Any reaction in a particular situation is based on behavioural models which have "*worked*" in similar situations. The lack of real practical experience of the HPS leads to the idea to provide the HPS with an "*artificial memory*". This means to use an opportunity to acquire data of situational games in virtual environment, to analyze the data collected, to derive indicators for recognition the particular situation, and to suggest a management decision. The recommendation is:

3 The simulators have to provide an opportunity for "case management" by modeling specific situations, acquisition and analyzing data and suggesting particular course of action.

Taking into account, on the one hand, the dynamic nature of the security environment, and on the other – the abstract charge of the social comprehension for "*safety*", the next recommendations are:

- 4 The simulators have to provide an opportunity for upgrading and modernization.
- 5 The M&S methodology and the supporting base (databases, software, workstations, etc.) are to be flexible enough in order to allow their adjustment to the changeable organization of the HPS.

The necessity of the simulators and M&S methodology flexibility can be developed in one more direction – the idea to use virtual environment for scientific purposes. The possibility to test different realizations of the HPS's architecture is to be provided by specialized software.

The second conclusion suggests that there are distinctive "*accents*" of the E&T process.

Preliminary preparation is performed on the basis of typical scenarios. The E&T process is carried out in circumstances posed by "*an unidentified risk*". Logically, the recommendation is:

- 6 The simulators have to support the following activities:
 - development of typical scenarios;
 - development of typical reactions in context of the typical scenarios;
 - examination of the HPS's functioning in the environment described by the typical scenarios.

The simulators support the following activities: training, planning, and research.

The recognition of the negative factor as "*a risk*" finalizes the preliminary preparation on the basis of

typical scenarios and the focus of the E&T process shifts to preliminary preparation on the basis of concrete scenarios. The recommendation is:

- 7 The simulators and the M&S methodology have to be able to select scenarios adequate to the current situation and to provide reliable prognosis for the possible development of the situation.

The last conclusion of the analysis led us to the idea, that the short-term adaptation process becomes dominant in relation to any other HPS's function. In fact, after the recognition of a negative factor as "a risk", the other activity, in practice, stop and "melt" into the background of the elaboration of a response to the current situation. Obviously, the paramount role of the short-term reactions suggests that the E&T process first has to provide "technical experience" for the operative personnel and "management practice" for the low hierarchical level managing staff, and only after that – to put attention on the preparation of long-term oriented adaptive reactions. This motive led us to the idea to try to answer the question if there is any relation between, on the one hand, the different accents of the E&T process, and on the other – the safety and security concepts.

Professor Donna J. Nincicl provides an interesting metaphor explaining the difference between the safety and the security concepts: "safety is doors open to allow free access for escape or rescue in a dangerous or unsafe situation. Security, on the other hand, is doors closed to prevent access to those who might wish to do us harm" (Nincicl 2007). Assuming, that "security can be considered protection from active malicious agents" and "safety, on the other hand, can be considered protection from accident, maritime casualties...", we went one step further and say that safety is "effect-oriented countering" concept, which means – short-term oriented. In the contrary, security is "cause-oriented countering" concept or – long-term oriented. Logically, the E&T process has to consider that safety related E&T is the basic prerequisite for the security related E&T. The recommendation is:

- 8 The M&S methodology has to provide correct balance between the safety and security orientations of the E&T process.

5 CONCEPTUAL MODEL FOR FLEXIBLE SIMULATOR ARCHITECTURE

The conceptual model of the "simulating complex" is presented in fig. 1.

The system "input" includes:

- "stakeholders" requirements;
- modelling and simulation theory and practice;
- cases from practice;

- technical equipment description;
- description of the organization.

The "input" serves the following functions: elaboration of a simulations methodology and data acquisition.

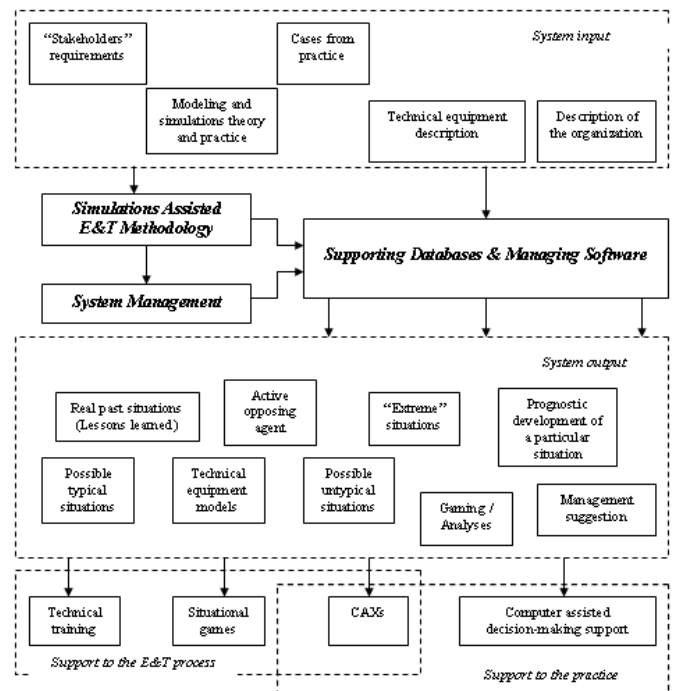


Figure 1 Flexible architecture for Port Security Simulating Complex

Taking into account a particular purpose of the E&T process and related modeling and simulations methodological procedures, the managing body (system) of the E&T process formulates the desired "output" products. This task is supported by a specialized for the case software.

Different combinations of the products are "unified" by the managing system (using the support of related managing software) in different E&T forms and/or forms of providing modelling and simulations support to the decision-making process.

At tactical level the simulating complex has to be aimed to mono-agency task training – fire brigade, police, port security staff, navy etc.

In accordance with the operational level of simulations simulation process has to be aimed to the representation of wide spectrum of operations. The requirements that the model has to follow are different than the previous (tactical) level ones. Because of the nature of operations, an important part of this level is the possibility to create a simulation of a crisis management system. The main purpose of the system is to shorten the time needed to make up the optimum cleanup decision, in order to reduce population losses, financial and ecological damage and other types of direct and indirect damage. In this

way the simulation system has to be a powerful tool for the support of emergency response decision making. The system should coordinate and control the activities of the units involved and provide information to all of the participants of decision making team.

The most common tasks for modelling at the operational level are:

- using electronic charts with possibility to edit, add and delete objects and information;
- portraying operational plans on the charts;
- route and resource planning;
- monitoring the resource motion;
- assessing response resources;
- comparative analysis of different plans, etc.

The last but not least is the application of M&S at the strategic level. At this level, the undertaken actions are similar to operational level, but generally they are more global and wide ranged:

- displaying strategic plans on the charts;
- resource planning;
- monitoring the resource motion;
- assessing response resources;
- comparative analysis of different plans, etc.

6 CONCLUSION

Even a passing glance on the proposed conceptual model of the Port Security Simulating Complex inspires the sentiment that the system proposed is a kind of “*perpetuum mobile*” for the moment.

Being conscious about the “*utopian*” charge of the concept proposed and keeping in mind that many things that were “*fiction*” in the past are parts of our life nowadays, we state that the real problem for

elaboration of a similar M&S system is not “*technical*”, but it is related to our willingness to solve it.

Its establishment in practice will help us to achieve the main goal of education and training - preparation of highly motivated and well educated and trained port security personnel.

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