

SITUATIONAL AWARENESS IN THE MILITARY ACTIONS MANAGEMENT FOR INTEGRATED SIMULATION SYSTEMS

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Abstract: *Preparing for a hypothetical crisis situation is perhaps one of the biggest challenges for decision makers, regardless of the societal field. The situation of military conflict on the territory of Ukraine with loss of life and considerable material damage requires a rethinking of awareness of the situation in the management of military actions. Adopting proactive behavior is the solution to identifying those possible solutions to various crisis situations. Integrated simulation systems applied in the management of military actions are the bridge for the development of solutions in a combined context of several societal areas, such as the protection of critical infrastructure. Integrated simulation systems make it possible to obtain partial results in the simulation of crisis situations, which determines the dynamic correction of military actions to achieve the objectives. The integration of the actions of the actors involved in a crisis situation, such as the one in Ukraine, allows us to obtain solutions for solving problems based on the formulated scenarios. Thus, based on a single scenario, it is possible to develop appropriate intervention reasoning for each aggression factor. The results of the repeated simulations are compared and a perspective can be obtained on the behavior of each actor involved in the crisis situation according to the situational changes. At the end of the simulations, databases are obtained that can be used in the subsequent real situations.*

Keywords: *Situational awareness, integrated simulation systems, military actions management, conflict in Ukraine.*

Relating Societal Domains in Understanding a Hypothetical Crisis Situation

The purpose of the military actions management is to direct the efforts in such a way as to achieve victory in a confrontation with an opponent. Starting from this statement, we aim to determine the essential but also the critical elements that need to be identified and used to build *a reference model in the problem of obtaining victory*. Exhausting the diplomatic means of negotiation between states often generates situations of military conflict with loss of lives and considerable material damage, as in the situation in UKRAINE 2022. Depending on the military means employed, there are a series of damage and destruction on all domains of society in the space of the military conflict. From this perspective, now more than ever, the contemporary societal environment is strongly characterized by the presence of a wide range of threats to all domains of society (political/ diplomatic, military, economic, social, critical infrastructure, information and environment). In this context, for each domain, the safety and security specialists seek to formulate solutions to avoid the materialization of the identified risks (NATO, NATO's military concept for defence against terrorism 2016). If we were to refer to one of the threat forms, namely terrorism, according to NATO: "Awareness is an essential factor for the planning, preparation and execution of all counter-terrorism activities" risks (NATO, NATO's military concept for defence against terrorism 2016). This is reflected in the provision and sharing of information and assessments related to terrorism in a specific area of responsibility, as well as in the identification and monitoring of a system of indicators for early detection of risks.

Due to the typical problems that arise from the specificity of each societal domain, they are somewhat isolated in terms of the way of managing the risks to which they are exposed. Operational isolation in this case can be seen as a potential source of other new risks posed by the inability to disseminate the implementation of solutions. Therefore, such a

conflict situation affecting the operational environment by applying solutions separately, on societal domains, can be avoided through a connected approach between the societal domains. In this way, a continuous and unitary analysis of the common societal operational environment can be obtained, which assesses the real effects and consequences of the military actions but also of those of the other actors. Such a combined approach contributes to the implementation of the whole process of counteracting the effects of a hypothetical crisis or an ongoing crisis.

Thus, a first step towards obtaining *that reference model in achieving victory* in a crisis of the societal domains consists in *the way they relate*, as it results from the NATO concept on the issue of terrorism. Societal connection is not limited to signing collaboration agreements on the sectors of common interest, but it is rather closer to the action planning process based on the model of planning military operations. This approach refers to the description of the structures involved in the safety and security of the functioning of each economic operator in order to identify the influencing factors involved or potentially participating in this common complex framework. In order to solve the situation, the lessons learned from the case studies will be disseminated to each structure in the cascading effects chain. Assuming that a structure in a societal domain can never be prepared for the moment of surprise, contingency plans will be identified. To be able to take over the shocks of a major impact negative event, the decision-makers take into account several options for solving negative situations by ensuring a sufficient number of resources in this regard. Identifying the reference model for achieving victory becomes a major issue that consists mainly in formulating the goal of not controlling everything in advance, but rather making available those procedures which can be applied to situations arising by surprise, called "Contingency plans" in military slang, as previously mentioned.

The second step in determining the reference model is to substantiate the relationship between the societal domains. This is done through understanding and being awareness of the abnormal situations or of any other fact that may lead to a crisis situation. In order to solve the context expressed above, one needs to answer the following questions: "How do we know that an abnormal situation can lead to a crisis situation and thus activate the contingency plans?", "What are these contingency plans?", "Who develops them?" and "Who takes responsibility for activating them?" In this context the tendency can be towards capitalizing on the alert categories of the warning indicators. In order to achieve real results, the unitary approach of action planning according to collaboration plans is applied, focusing the efforts on the situational awareness based on the exchange of information and the development of a common data base on understanding it, as a result of the lessons learning from the previously conducted case studies.

Another step of the process, without a chronological classification compared to those expressed above, may be to capitalize on the experience of the case studies based on threat scenarios. The advantage of exploiting the results obtained from the case studies is the possibility of identifying rules and measures that can be adapted to avoid the occurrence of the negative events and also of the identified risks; in other words, it is possible to show a PROACTIVE BEHAVIOR. This type of behavior is well known as a form of individual commitment when faced with a danger by directing the resources to the area of the incident, an area belonging to the operator's area of responsibility. Things change fundamentally when it comes to joint action in the event of a common threat, a situation in which it is no longer possible to direct the resources due to the lack of coherence regarding the unitary approach of the negative event with a major societal impact. This context leads to understanding the importance of relating the societal domains in order to unitarily understand a hypothetical crisis situation and moreover, of directing of resources towards the epicenter of the crisis.

This type of problem requires a common awareness of the situations, especially of the abnormal ones, so that an effective proactive behavior can be achieved.

After the occurrence of the negative event with major societal impact, when the monitored warning indicators have activated in an overdue response time, the affected societal domain enters the situation of activating the specific procedures for each case, respectively a reorganization of the remaining available resources by activating the resilience capabilities. The unitary approach, from a societal point of view, in case of a materialization of the negative event with a major impact is one of the tender challenges of managing emergency situations. Although in the literature "emergency management" includes a limited number of institutions, all societal sectors are or will be affected by the degree and the quality of the decisions made individually and less by consensus. From this context, it can be concluded that an emergency situation, which expresses a state of abnormality, depending on how it is managed, can degenerate into a situation of deep crisis or military conflict, as in the situation in Ukraine 2022.

Situational Awareness in the Military Actions Management

In most hypothetical situations, we can talk about a societal crisis when at least two societal domains or their sectors are affected by the influencing factors, mainly coming from the external environment. Managing such a situation in current practice consists in dividing the problem into several branches of management such as: risk management, consequence management, emergency management or other forms of management for situations of abnormality in the societal domains. Regardless of which branch of management deals with a crisis situation, in order to initiate the process it is necessary to know or to be aware of the situation of abnormality.

In retrospect, the concept of situation awareness was first formulated during the First World War by Oswald Boelcke (R.G.Head 2016). The former understood that it was a fundamental condition "to gain awareness of the enemy before he gains a similar awareness of the confrontation." Such a concept develops the possibility of inquiring the crisis situation from the perspective of making a distinction between how the status of the analyzed system is understood by the decision-maker and the actual status of the system which is constantly changing and tending towards a series of abnormal or crisis situations. Thus, the concept of combat is seen as a crisis situation through "Auftragstaktik" which comes from "Auftrag und Taktik", a concept later known as "mission command". This theoretical approach promotes a form of military action described by emphasizing the outcome of the mission in relation to the specific means of achieving it (a concept updated in the Bundeswehr as "Führen mit Auftrag"). The military conflict seen as a crisis situation is essentially achieving the victory or defeat of the enemy. The path to the desired end state – the victory! - can be considered as a succession of events that take place in space and time, after which the fulfillment of the objectives formulated in the action planning process is analyzed. The way of expressing and pursuing the achievement of the objectives in the path to victory is the fundamental expression of the management of military actions. In this context, we notice that the events planned to achieve the stated objectives may get out of control due to the complexity of the operational environment in which a number of known or unknown actors operate.

The combat space or the confrontation with an enemy can be interpreted as a complex system of systems. Such a system can be known by identifying those situation descriptive indicators based on which adjustments can be made through the specific mechanisms of the management of military actions. Throughout a military operation, the control and adjustment actions resulting from a misunderstanding of the situation could lead to the materialization of those negative incidents with a major impact. A direct result of the concept of "situation

awareness" is the change in the behavior of the decision-maker in which the predominant concern is to know how the system works, which is based on the descriptive vision in terms of decision making. Thus, we can infer that any task that requires the achievement of an objective involves observing, identifying and recording the events with direct implications on the situational assessment. In order to build a reference model in this regard, we recommend following the logical chain of working and information processing on three distinct stages: PERCEPTION – COMPREHENSION – PROJECTION (Endsley 1995).

In other words, it is understandable that the decision-maker is at the heart of the context of the interaction between himself and the operational environment and that the human factor is what defines the situation awareness. Therefore, the achievement of an objective and more, the achievement of success, are conditioned by the way of accomplishing this logical chain: PERCEPTION – COMPREHENSION – PROJECTION according to the model in figure 1.

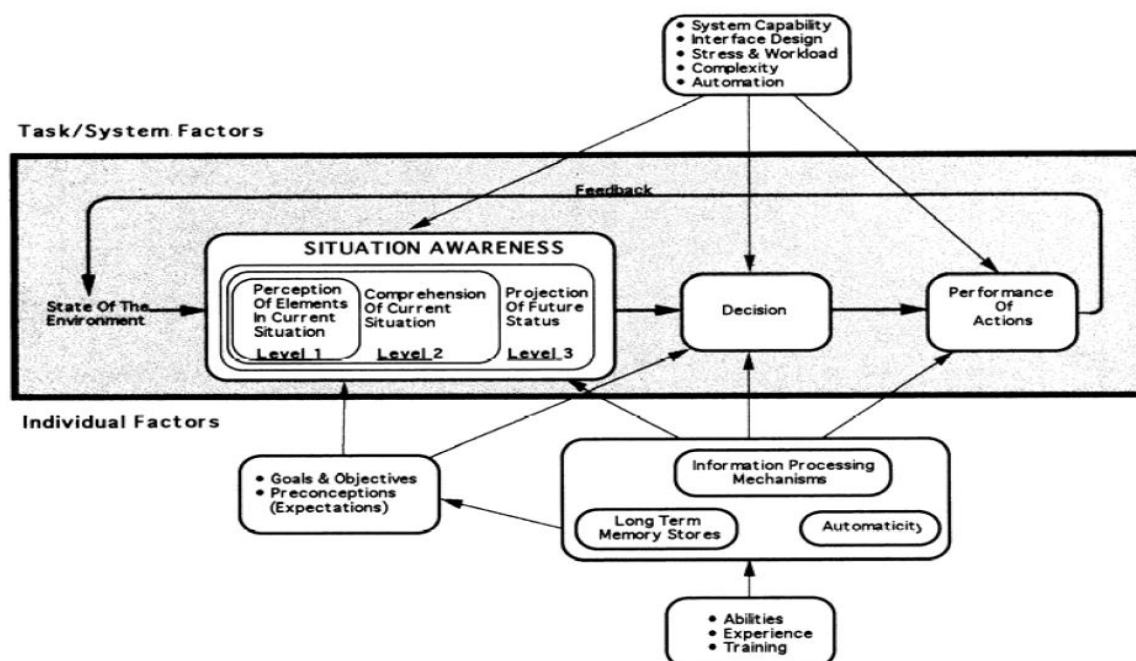


Figure no 1. Model of situation awareness in a dynamic decision making process (Endsley 1995)

Achieving the objectives formulated in the process of planning military actions is conditioned, as previously mentioned, by the situation awareness. Identifying the factors or the actors that contribute to the conduct of the events (as mandatory steps in the path to victory) is an injunctive component of the intelligence preparation of the battlefield. Defining the combat environment and describing the effects result from interacting with the actors and the influencing factors of the combat environment. In this sense, we identify two distinct and mandatory steps for assessing the enemy, namely interpreting and formulating predictions concerning his intentions and behavior during the events. The three-level model of the Situation Awareness: Level 1 – Perception of elements in current situation, Level 2 – Comprehension of current situation and Level 3 – Projection of future status is the basis for decision making. In other words, not only the condition of "making informed decisions" is met, but rather there is an opportunity to maintain contact with the target – the enemy and to anticipate his actions. Following the study of the relationship between the components of the situation awareness model, it results that the conduct of actions is conditioned not only by the

quality of the decisions but rather by the way the feedback is achieved, namely knowing the "State of the environment".

At the core of the management of military actions is the informational support on which the concept of the operation is built and the variants of solving the operational problem are developed, so that the solutions lead to the achievement of the desired end state. Obtaining joint work patterns of planning teams in military actions is the test that the commanders who are ultimately responsible for the success or failure of a real confrontation with an enemy have to pass. A crisis situation can be interpreted as a possible development of an abnormal state. Moreover, taking the steps established for management of such a situation may be subject to the field of modeling and simulation, so that, through repetitive assessments, they are able to support the development of the contingency plans, which are necessary to be built and prepared especially for hypothetical crisis situations in work teams, leading to a result like the one shown in Figure 2.

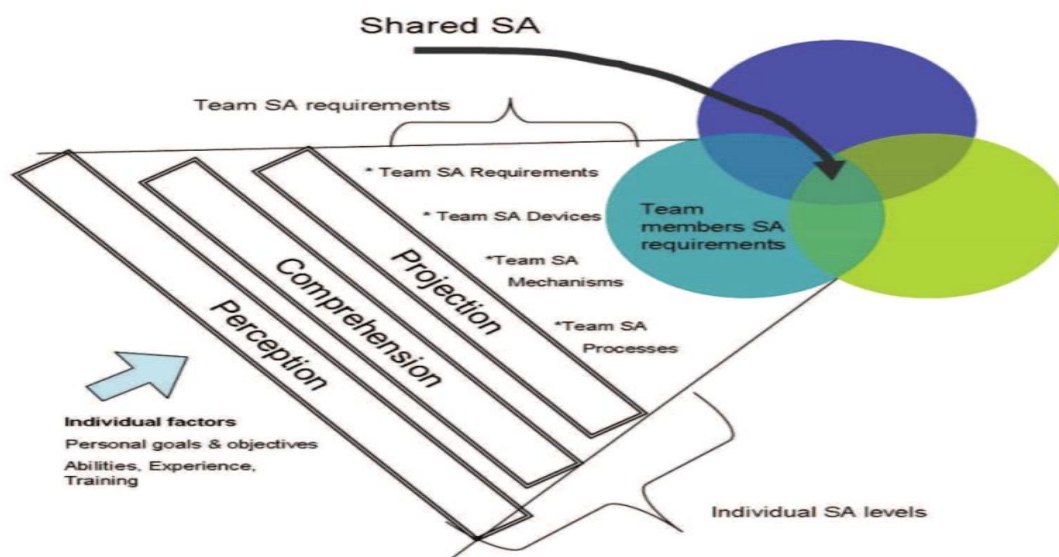


Figure no 2. Situational Awareness (SA) Model combining all the SA elements needed to be taken into account at the organizational level to support decision making in collaboration (Koskinen-Kannisto 2013)

The analysis of the multidimensionality of the operational environment in the management of military actions is performed by decomposing the confrontation environments on the criteria of space and time, which combined with the operational criteria result in the perception and the awareness of the situation. What we can observe at this moment is that the two components PERCEPTION and SITUATION AWARENESS are approached separately in the sense that awareness of the situation is the higher form of work in the process of planning military actions. The peculiarities of the results from the analyses are given by the quality of the individual factors that contribute to the perception and awareness of the situation. As shown in Figure 2, the individual results of the logical chain PERCEPTION – COMPREHENSION – PROJECTION are convergent towards fulfilling team tasks without resolving the classification of their importance and namely prioritizing them by assigning weight to making the final decision. In order to solve such a situation, we resorted to deconstructing the Desired End State in two directions so as to result in the importance of the decomposed work and respectively the differentiated role of the work teams within the joint project. In this way, the management of military actions differs on hierarchical levels depending on the role of the work teams in the two directions of effort (figure 3). While performance indicators measure the execution of tasks, the efficiency indicators measure or help to design the effects by which objectives are met. Figure 3 shows the tactical assessment of engaging the targets through the three components: “Battle Damage Assessment”, “Munitions Effectiveness Assessment” and “Re-attack or Future Targeting”.

Achieving the desired end state or obtaining victory are conditioned throughout the events, which is why, as we argued at the beginning of this scientific approach, it is necessary to establish very clearly the reference indicators against which we gain perception and awareness of the situation. By differentiating the two components of the management of military actions (perception and awareness of the situation), it is possible to obtain the list of risks identified and associated with the measures and rules applicable to the contingency plans. If the perception of the situation represents the passive form of the management of the military actions, the awareness of the situation represents the active form in this context of the planning the military actions. We therefore conclude that a new perspective of the military confrontation has been obtained on four dimensions: ANALYSIS OF THE SITUATION, PLANNING OF THE OBTAINED SOLUTIONS, EXECUTION OF THE OPERATIONAL PLANS and THE ACTUAL CONFRONTATION WITH THE ENEMY. The first pertinent question might be, "Why did we differentiate between the EXECUTION phase and the CONFRONTATION phase?" The answer lies in the concept of "situation awareness" because of the fact that the identified solutions are a theoretical result of the management of military actions while the confrontation is the only means of validating the obtained solutions to solve a crisis or military conflict.

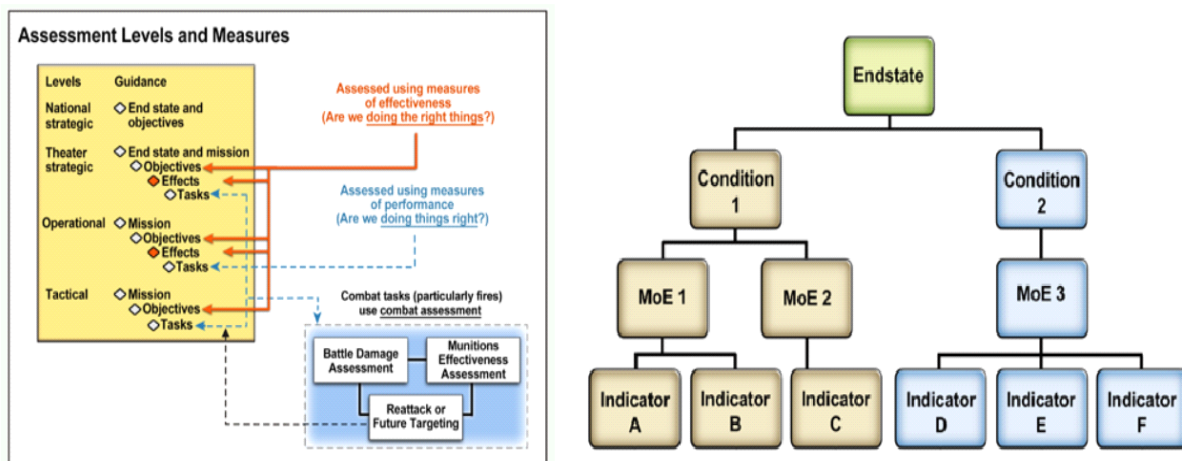


Figure no 3. Schematic representation of the role of the Measures of effectiveness (MoEs) in the situation awareness cycle (Westphal 2014)

The distinct contribution of the two sets of indicators (of performance and effectiveness) make the feedback loop shown in figure 1 possible, so that at least the perception of the situation is achieved as a preliminary step for the awareness of the situation and implicitly for the possibility to formulate predictions. From the above, it is possible to foresee the enemy's courses of action as a result of the predictions made based on situation estimates (made by the work teams according to the situation awareness on the three progressive levels). This can add value in terms of the possibility of obtaining effective solutions to the problem that defines a state of crisis or military conflict.

Instead of Conclusion – The Importance of Integrating the Modeling/Simulation Systems into the Situation Awareness Process

Due to the multitude of the influence factors and actors involved in planning and conducting an event (in the context of the modern battlefield) it is difficult to develop and manage the status indicators (performance and effectiveness). In solving this, a very important role is played by the modeling-simulation systems, developed for the management, respectively the planning of operations processes. Starting from the prerequisite that the

decisions may be the result of models for designing the operational reality, a series of simulation systems were built in which, based on real-life data, various experiments and case studies could be performed. The modeling method is a tool of scientific knowledge that allows the elaboration of the solutions to solve the societal problems, which based on knowing the essential characteristics of the influencing factors, respectively the behavior values of the potential actors involved in the development of the potential negative events, make it possibly to identify certain risks and the solutions to deal with them. In the perspective of defining the modern battlefield as a system of multidimensional systems that have specific features and intuitive behavior, it was possible to virtually transform the components of the operational environment.

Another conclusion is to capitalize on the defining features of the influence factors and of the actors involved in a hypothetical military conflict with direct implications on all the societal domains, which allows us to be aware of the current situation and, even more, to make predictions about several possible futures. Describing the future or making predictions about what a situation will look like in an acceptable time horizon allows the military planners to manage actions aimed at achieving the goals that lead to the achievement of objectives and ultimately to the desired end state. In other words, the modeling-simulation systems allow a sufficient number of case studies to be carried out. These are obtained by changing the status parameters and implicitly the behavior of the actors, which have important results following the interactions between them and the common operational environment.

From the context presented throughout this article, it is worth mentioning that all the simulation systems are based on the theory of the behavior of each known actor and that this behavior may change depending on their own awareness of the situation in which they may be at a given time. This opens new perspectives for research on the field of situational awareness in the sense that each analyzed subject has its own personality and therefore unpredictable reactions to the action of the external stimuli. Therefore, it is safe to say about the simulation systems that they are limited in terms of the unpredictable behavior of the actors involved in a possible negative event and they are implicitly a distortion of the reality in the virtual environment. However, the simulation systems remain tools for analyzing and planning military actions, the results of which can be combined with observations from lessons learned from the study of recent military conflicts, the conflict in Ukraine or the solved crisis situations.

The catastrophic damage to all societal domains, significant material destruction and loss of life on the territory of Ukraine questions the predictability of the military behavior in relation to the other societal domains. Identifying the effects according to the statistical reports on the minutes, hours, days and months of war in Ukraine and knowing the normal functioning of societal domains, by applying the three-level method of situational awareness, may be possible by reversing the process of analysis to gain new perspectives on the aggressor's behavior. Knowing the aggressor's behavior as the military conflict correlated with the sanctions on different societal segments at the international level allows the decision-makers to direct their efforts towards obtaining advantageous negotiating conditions for the cessation of hostilities.

Last but not least, we must point out that, no matter how advanced a simulation system may be, it will not be able to keep up with the dynamic behavior of the large masses of people who are part of the societal domains. The major advantage of applying the situational awareness method is the possibility to decode the contemporary operational environment and to extrapolate on how the actors will manifest a certain behavior by altering the conditions of the situation. In other words, there is a change in the importance in assessing the type of operations by purpose: decisive, modeling and supporting operations, so that the role of the modeling operations becomes a priority and the decisive operations become a natural result of

the modeling ones. Certainly, in the not so distant future, the artificial intelligence will intervene and change the expectations of the modeling – simulation systems in the sense that perception will merge with situation awareness.

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