



ASSESSMENT INDICATORS TO RATE THE ACCOMPLISHMENT OF ANTI-AIRCRAFT RESPONSE MISSION

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The complexity of the military actions related to the anti-aircraft response, the complete and in-depth knowledge of the systems' state implies, among others, a permanent measurement of the planned actions progress. Permanent changes, a priori accepted, can decisively influence the guidelines and conditions for carrying out a plan of operation, deviating it practically from the commander's intention. In order to maintain the initial design, but also to recognize the inherent turning points, it is necessary to establish relevant evaluation indicators starting from the action planning stage, which offer actionable sustainable decision alternatives. The accomplishment evaluation of the anti-aircraft fire system's mission cannot and should not be represented only by (pre)determined figures; it must treat, subjectively and objectively, the state of the system, while also providing irrefutable evidence of meeting the stated objectives.

Keywords: assessment; indicator; anti-aircraft response; system.

„Measure what is measurable and make measurable what is not so”.
Galileo Galilei

In a very broad sense, any management process is defined, conceptually, by the following functions: planning, organization, coordination – training and control – assessment. In relation to the way in which these attributes are implemented and exercised, the procedural staging of the management (temporal and actional), integrates three phases: forecasting, operationalization and, not least, assessment and interpretation of results.

Regardless of the functional area or the type of organization, the final phase, respectively the assessment and interpretation phase, is characterized by the preponderance of exercising the control-assessment function, both on the achievement of the objectives, the correctness of the decisions and procedures applied, as well as the corrections generated by the systemic interactions. Therefore, establishing the methods, instruments and means of measurement, simultaneously with the application of the performance indicators – as a standard function – and the incremental assumption of the corrective measures, acquire defining valences in the fulfillment (or not) of the organizational objectives.

Speaking of assessment, we cannot help but mention the performance. In fact, the assessment,

as a process, implies, *inter alia*, the establishment of minimum performance governance thresholds, which must be analyzed within the limits imposed by the environment in which they operate. At the level of an anti-aircraft fire system, the one that generates the active anti-aircraft response effect, the performance is itself a management process, reflecting, static and dynamic, the level of organizational maturity. This (performance) *revolves* around the received mission, contributing to the adoption of flexible, supple and dynamic decision-making.

Even those who are unfamiliar with the concepts of tactics, strategy or organizational management have spoken at least once about the cost/benefit ratio, even in its primary, rudimentary sense, of obtaining personal advantages. Transposed into military language, this eternal decision-making dilemma *would be translated* by a reference to the sufficiency of the actions *vs.* the final result or, in other words, how effective they are as a whole in counteracting the potential enemy; how far I am willing to engage my resources so that the victory obtained is not, for example, *à la Fabian*; what are the indicators that cause me to continue or to stop; how to manage to overcome critical moments, using accepted resilience values.

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Some of the key terms of this article are well known to all intelligence users in the military environment. Referring strictly to the anti-aircraft response, its meaning is superimposed, up to a point, to that of the combat function assimilated to the air defence. The differences are nuanced, implying the detailed knowledge of the role, place, characteristics, maneuverability, etc., of the artillery and anti-aircraft missiles structures, in accepting the violent characteristic of the first, in all the stages of a military conflict, in delimiting the passive side from the active ones and, why not, creating the obvious emotional impact following the effects, obtained by kinetic strikes.

Returning to a specific spectrum of analysis, that of the anti-aircraft response in its implicit relationship with the air enemy, the assessment of the combat actions creates the input data for the decision-making process, in a *decision-type loop* relationship (action-reaction-counteraction). The aid granted to the decision maker refers mainly to deepening the understanding of the operational environment (as a reaction system), knowing the progress of the mission (by marking the tasks performed) and by guiding to the future projection of the forces, planning, prioritizing and introducing them into combat. The adaptive function is the answer to "why so", conditioned by "what we must do" in three areas:

1. Evaluation of the task by evaluating the performance (are we doing things right?);
2. Assessment of the operational environment (do we do the right thing?);
3. Evaluate the operation by evaluating the progress (do we accomplish the mission?).

The assessment indicators focus on respecting the components of the operational design, explaining by appropriate values whether the initial plan (tactical thinking) of the commander subscribes to the success criteria, established in the planning stage. Based on these, the commander follows the progress, estimating permanently, quantitatively and qualitatively, the degree of involvement of the available resources. This balances the dependence on human judgment (the qualitative factor) with direct observation and the mathematical rigor (the quantitative factor), in order to reduce the probability of making wrong decisions. *Why* is the link between cause and effect, and the indicators the absolute values of optimizing the systemic behavior of the anti-aircraft fire system.

Concepts regarding mission assessment

The impact of the technological evolution of the means of striking from the air, the true paradigm of the reconsideration of the spatial dimensions of the *different war*, gave theoreticians, studying the phenomenon, the possibility to rethink the concept of anti-aircraft response, analyzing it directly, causally, in relation to the amplitude of the aerial threat. Passing beyond the definition from the dictionary, *the anti-aircraft response* represents the set of determined actions, planned in a unitary conception, in an actional and space field extended to all the structures of the system¹. As a result, the essence of these efforts consist in the actual battle with an aerial enemy, carried out by the active vectors (artillery and anti-aircraft missile systems), with the general purpose of firmly defending the sovereign airspace, maintaining the freedom of movement of its own forces and to protect the critical territorial objectives / infrastructure.

The defining parameters in this multiple cause-effect assessment relationship (of reactive type) are identified in the following characteristics of the overall military actions: discovery and timely identification; precision of strikes at high speeds of the targets; combat/destruction of enemy platforms in a short time; adequate maneuvering of forces, means and fire; misleading; protection (in all its forms); resource optimization; judicious distribution; initiative; surprise (and avoidance of it). Moreover, from my point of view, the action of the active side of the anti-aircraft fire system produces its effects in all phases and stages of a military conflict, through the two components: deterrence and menace. Therefore, the role of the indicators for assessing the degree of accomplishment of a mission is very complex, allowing the generic plans to be readjusted by the ones of gradual response, integrating the dedicated crisis response system with the other strategic elements or means.

In paraphrasing Foch, we can say that, in the absence of reliable and stable indicators of assessment, continuous changes, whether it is organization, structures or maneuvers, are reached. Before analyzing the role of assessment indicators, however, I think it is necessary to briefly define the main concepts related to mission assessment and whose application helps to support the decision-making process as a whole.

Thus, the assessment represents:

- A continuous process that measures the overall efficiency of employing combat capabilities during the conduct of military operations;
- Determining the progress in fulfilling a task, creating conditions or reaching an objective²;
- The activity that allows to measure, from a military point of view, the progress and the result of a campaign / operation, as well as the statement of conclusions and proposals, in support of the decision making³;
- Activity by which the information on the status and functioning of a system of the results it obtains are collected, processed and interpreted, activity that leads to their assessment on the basis of criteria and to ameliorative decisions⁴;
- The multidimensional process of obtaining information, with the help of assessment tools, in order to elaborate value judgments, related to the proposed criteria and which are finalized with assessments that allow decisional corrections⁵.

In NATO, operations assessment is defined as "the function that allows the measurement of the progress and results of operations in a military context and the subsequent development of conclusions and recommendations that support decision making"⁶.

NATO 2011, 1-1). It is generally equivalent to the "monitoring and assessment" used by many government agencies and civil and international organizations⁷.

Assessing the progress of a mission, based on processes of objective and subjective measurement of data and information collected and verified from multiple sources, provides a set of useful tools to the commander and his team, to increase the performance and effectiveness of the actions, as well as to verify the degree of mission accomplishment.

The assessment of the mission⁸ is inherently conditioned by the factors of time, resources and space, the desired effects having to be associated with the terms, the optimization and the multidimensional classification of the military action. As a distinct stage, I consider that the assessment should be applied to any decision making cycle, once the decision points (pre) built in the operational design have been reached. The psychological and information effects are much more difficult to evaluate, due to their subjective

and sometimes redundant nature, and where the causal relationships between actions and effects are more difficult to establish. In such situations, assessment tools are based, mainly, on often intuitive perceptions, being influenced by the level of culture and understanding, specific to the situations themselves. Synthetically, the assessment components are presented in Table no. 1.

The critical variable is represented by that key resource or condition integrated into the operational environment that has a direct impact on the objectives and can affect the achievement of the desired final state, by influencing the effects.

In a systemic approach to the concept of anti-aircraft response, *the effects* can be defined as: the physical or behavioral state of a system, following an action, simple or complex, or another effect; the result or consequence of an action; a change in the condition of the system, its behavior or its states of freedom⁹. Derived from objectives, the effects must be interpreted as a link between these and the tasks, which gradually measures the decision.

It is imperative to understand that, regardless of the method of planning chosen, our actions will create effects, both positive and negative, thus affecting the performance. Their assessment will generate a complex range of results, throughout the entire mission, which will have to be exploited in a timely manner, both in time and in space.

Within the operational environment, we try to determine the causality of the effects, in order to develop further actions, directed to the desired result (the final state). Part of the planning process consists in estimating the outcome of actions. Even if it is an extremely complex task, especially when there are several distinct lines of effort, and we can rarely be sure of an outcome, we must issue value assumptions, precisely to establish the causality. The connection between "X" – if we do – and "Y" – we expect the result – becomes important only if we have established a method for determining the progress, which also includes assessment indicators.

End State – A set of necessary conditions that define the achievement of the commander's objectives¹⁰.

As Clausewitz wrote, "no one begins the war – or, rather, no one should think about doing it, without first having it clear in his mind what he intends to achieve through that war and how he



Table no. 1

ASSESSMENT COMPONENTS – SYNTHETIC

Assessment issues	Task assessment	Operational environment assessment	Assessment of the mission/operation
Source/basis for criteria	Tasks/OPORD	Desired conditions / OPORD	Final objective (success criteria)
Criteria	Essential MOP	Essential MOE	MOE
Indicators	Mostly quantitative (for example, is task accomplished to the standard?) May the commander have a qualitative contribution?	Balance (quantitative and qualitative)	Balance (quantitative and qualitative)
Means of data collecting	Reports (subordinated structures)	Reports (subordinated structures); third parties	Reports (subordinated structures); third parties
Analysis and assessment	Current operations; the experience of the commander (quality)	Interaction between qualitative commander / decision cell) and quantitative (evaluation group); Based on parallel assessment; Synthesis of evaluation	Combination between quantitative and qualitative; Analytic interpretations.
Periodicity	Daily	Periodically (formal / informal – in phases)	Depending on the effects
Interactions	Staff - recommendations / commander - decisions		

Source: own

intends to lead it. The first is its political purpose; the second is its operational objective”¹¹. Many local or foreign publications explain the importance of knowing the final state, not only as an exaggerated desire to win, naturally otherwise, but especially to understand the ways and means of achieving it.

The performance measurement, technically defined, represents a set of criteria necessary for evaluating one’s own actions, closely related to the performance of the tasks received¹². As a process, it focuses on identifying, monitoring and communicating results through the use of performance indicators. The performance measurement is preoccupied with the *assessment of the results*, as opposed to the performance management, which includes the decision making process based on the results of the measurement, in order to obtain the desired performance. Performance measurement is a necessity to support the performance management system, facilitating the understanding, management and improvement of the results, obtained by measurement.

The indicator, in the sense explained by the dictionary, represents a numerical expression

for the quantitative characterization of a social-economic phenomenon from the point of view of composition, structure, time change, mutual connection with other phenomena, etc¹³. Adapted to the military environment, it is an information carrier that, in the context of expressing the assessment, provides information about performance and / or effectiveness.

At all levels, the commanders must enforce the application of assessment indicators to track the progress of the task/mission/operation. Indicators can help decision makers both directly and indirectly. I believe that there are three major technical goals of these: providing information on the executive cleavage (in all forms); setting priorities by identifying key factors that cause pressure on the mission; monitors the effects of responses to enemy reaction (Figure 1).

The efficiency indicators (MoEs)¹⁴ are: 1. The criteria used to evaluate their own actions and which refer to the performance of tasks; 2. Instruments that evaluate changes in system behavior, capacity or operational environment¹⁵.

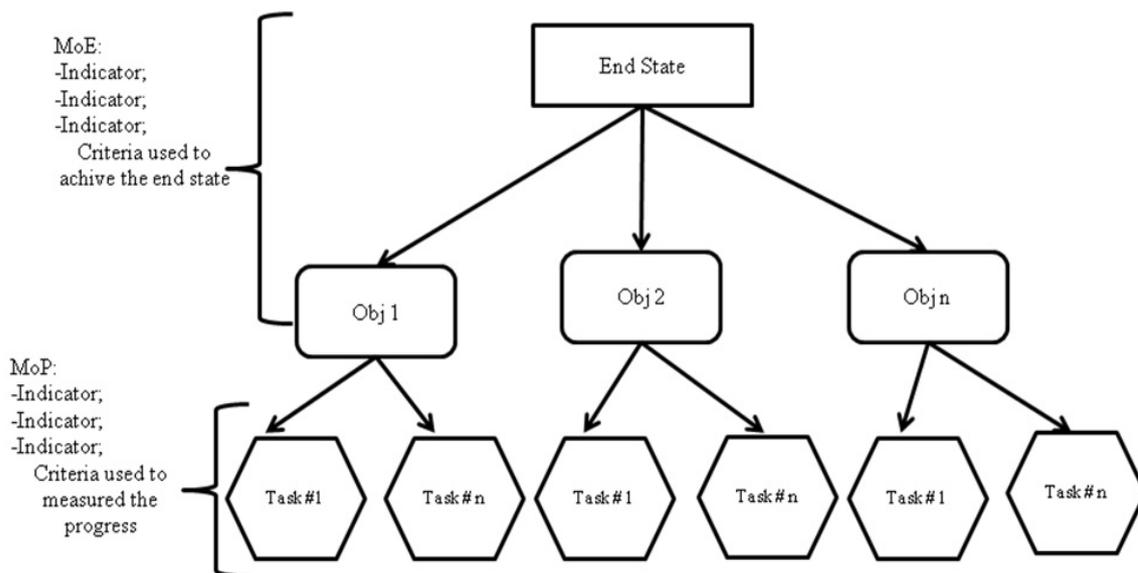


Figure 1 The hierarchy of indicators according to the final state
Source: own

At their basic level, the MoE should be developed to measure that information from the operational environment that show signs of progress towards creating the conditions, described in the final status of the commander. MoEs are evaluated using subordinate measuring instruments called indicators, which are information elements related to them. Each of the conditions can be measured

by one or more MoEs, while each MoE can be supported by one or more indicators (Figure 2).

The establishment of the MoE during the planning is a very important activity, the correctness of which results in the success or the failure of the mission, the wrong measurement could prejudice the recommendations or the subsequent decisions. In a hypothetical example, we can measure the number of destroyed or combated aerial platforms (one criterion), or the number of anti-aircraft defended objectives that had freedom of movement, due to the action of the appropriate fire system (second criterion). The perception of one's own actions changes radically if we refer to the first criterion, no one denying that a large number of destroyed enemy targets ensures the success of one's own mission!

Performance Indicators (MoPs) are a set of measurements or values that reflect performance in terms of progress towards reaching a goal. In other words, it is a tool within the reach of the decision maker that reflects the degree of fulfillment of some determining parameters of the system.

From the point of view of measurement reference, both MoE and MoP can be internal and external, qualitative and quantitative, with characteristics exclusively related to endogenous interactions (reference system – component elements) and exogenous (reference system – external environment). (Table no. 2).

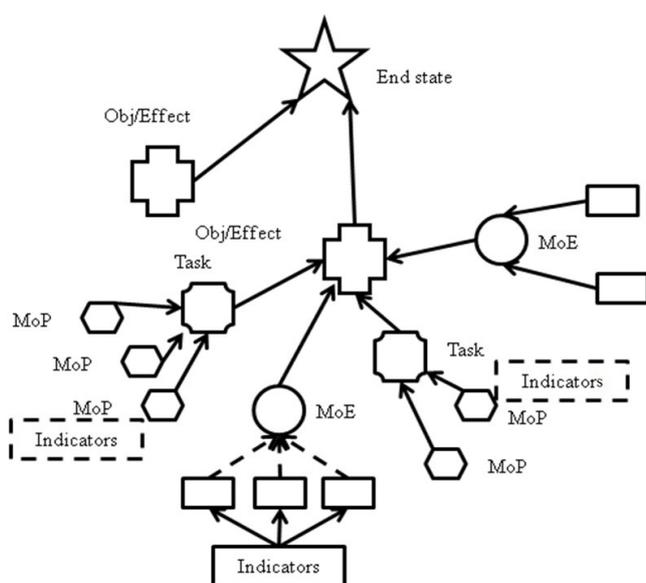


Figure 2 Relationship between MoP - MoE - Indicators - Final status
Source: own



Table no. 2

KEY FEATURES OF MoP / MoE / INDICATORS

MoE	MoP	Indicator
Answer the question: Are we doing the right thing?	Answer the question: Are we doing the correct actions (the right ones)?	Answer the question: What is the status of MoEs and MoPs?
Measure the purpose (the extent to which it is achieved)	Measures how the task is performed	Measures raw data inputs to enable MoE and MoP
Measure why? in the mission status (organizational status)	Measure what? in the mission status (organizational status)	Use the information to measure why? and what? is possible
No hierarchical relationship with MoP	No hierarchical relationship with MoE	Subordinate MoP and MoE
Often formally follows plans (design)	It often follows the execution matrix formally	Often formally follows plans (design)
Pretty difficult to choose the right ones	Pretty easy to choose the right ones	Usually just as difficult to select correctly either MoE or MoP.

Source: Adapted according to the Operations Evaluation Manual, S.M.G.-60, Bucharest, 2012.

It is important to endorse the main difference between MoP and MoE. As I stated earlier, the first (over which the planners have control) measures *the state of their own action*, of the effort focused on one direction, but not the resulting changes; the second, by observing system changes, measures the *impact* resulting from the progress of the operation, but without having direct control over it. For example, for an anti-aircraft fire system, a MoP can be represented by the optimization of anti-aircraft defence objectives (allocation of forces), and an MoE can be represented by the number of aerial targets combated / destroyed with an *N* number of target channels. Therefore, there is a type of inner-inner relationship (for MoP) and one inner-outer (for MoE).

Anti-Aerial Reply And Assessment Indicators

The former US Secretary of State, referring to the need to establish performance and efficiency indicators, stated in October 2003 that "Today we lack the metrics to know if we win or lose the global war on terrorism". Of course, in the years after 9/11, 2001, it was enforced, more than ever, the change of the state of the global security system, considered to be impregnable until then. And, among other things, it was necessary *ab initio*

measurement of the efficiency of the international reaction, initially essentially military, against some proven terrorist organizations.

Trying to determine a list of assessment indicators for measuring the degree of anti-aircraft response mission is not an easy task. By making reference to the value expression of the combat potential of a military structure, the factors taken into account in that complex equation should also be found in establishing at least the MoP¹⁶. Moreover, each component of the multi-system has its own limits, doctrinally, technically - tactically and procedurally positioned. And if, above all, we overlap the role and place of anti-aircraft artillery and missile forces, in a complex, multi-dimensional, integrated and dynamic approach, we have the complete image of an inter-disciplinary reporting of the assessment of an anti-aircraft combat mission.

An efficient assessment includes both quantitative (observation-based) and qualitative (cognitive) indicators. An essential aspect is precisely the dimensioning of the relationship between quantity and quality, between human judgment and mathematical rigor, between process biases and elimination of observation errors. The appropriate index depends on the situation, the



nature of the mission, but also on the resources and sources of assessment.

In the assessment process, a quantitative indicator (Ic) is always based on observation data, which provides the information support about an MoE or MoP. For example, the number of combat helicopters fought at the second moment of the defensive operation, while ensuring the air defence of the forces and means of the armored brigade. During the data collection process, the choice of sources, methods and standards for observation are very important, requiring judgment (experience, knowledge, intuition), both for their integration into the MoE or MoP, as well as for refining and eliminating redundancy or information inflation.

Qualitative indicators (CI) represent *something* very complex, but that cannot necessarily be expressed metric (*opinions / views* of the commanders, as a decision maker, the organizational experience transposed in a specific way of action, a state / trait or an essential factor of the system). For example, morality is, in my view, a qualitative indicator, impossible to establish in absolute values, but which can be estimated by expressing the judgments of the experts in the field.

Differentiating between qualitative and quantitative indicators is very useful, which requires in-depth knowledge of the components of the operational environment, their operating *laws*, as well as the links between them. For an anti-aircraft response system, for example, knowing the launch locations of the UAVs and their number is a quantitative indicator, as opposed to their type, which is qualitative. Combining them will lead to an estimation by the commander regarding future enemy actions. The systemic reaction is also found in its own similar indicators, which must be evaluated only after the intervention of specialized systems (ISTAR, combat, logistics, etc.).

From my point of view, the establishment of the MoP is a more incremental activity, resulting, first of all, from the observation the results obtained during the exercises of different types. Most often reflected in the TTP, the performance indicators related to the assessment of an anti-aircraft response can be *ante factum* established, accepting the following main conditions: to be observable; to have a relationship between them and their actions; to be measurable, specific and concrete; to relate to the time factor; to clearly reflect the changes in a relevant time period.

The activity of establishing the efficiency indicators is much more sensitive and difficult, especially since, as doctrinally related to the actions of a hypothetical aerial enemy, the anti-aircraft fire system cannot (yet) have sufficient resources to anti-aircraft defend all targets from AO. Of course, in one direction it can be considered that the conditions for the rejection of air attacks are fulfilled, but in my view we should not confine ourselves, only to the direct actions (aerial – antiaircraft), but also to the preliminary, complementary or support (modeling).

For example, taking into account combat / destruction probabilities, as indicators, supports the resource optimization process, but does not fully resolve maintaining / (re) gaining control of airspace. On the other hand, a maneuver (by forces and means or fire), executed properly, can produce more effects in the general context of the fight, of course, than a battery of anti-aircraft missiles (as a target-generated effect).

The efficiency indicators must be established and integrated at all times of the battle, from the planning stage, evaluated and updated after each decision point, according to the following main criteria: organization of the anti-aircraft response system; the number of objectives to be anti-aircraft defended; the estimated calculation of the enemy's aviation / helicopter / UAV resource; the type of major operation; estimated force ratio (COFA¹⁷).

From the point of view of the components of the multi-air anti-fire system, the effectiveness indicators will be found next to the fields: information; decision making; shooting; of support; CIS; protection.

From the point of view of the degree of detail in relation to the actions of the enemy, MoE can be exhaustive or minimal. Here we can strictly summarize how many enemy aerial platforms we destroyed (minimal) or how much we fought, but not only by kinetic actions, of direct hit, but also by maneuver, misleading, aerial ambushes, deception, etc. (Exhaustive).

The components of an MoE reported strictly from the moment of receiving the mission to combat / destruction must be related to: evaluating the effects produced by the anti-aircraft fire system as a whole; assessment of the side effects; assessment of the effects produced by the target channels; resumption of response.



In a strict cause-and-effect relationship, one can try to develop indicators that: 1. evaluate the physical and mental effects; 2. evaluate the functional effects; 3. self-evaluate; 4. permanently ensures an informational assessment (determining the informational report). In my opinion, the most relevant but also difficult to verify are the functional ones, which can allow, for example, an assessment of the time required for the enemy to resume the mission, reconfigure hit packs, etc.

We know that the anti-aircraft response is not just about launching or firing rockets or anti-aircraft artillery. The intermediate stages of preparation involve specific actions, within a unitary conception and for which specific assessment indicators must be established.

We may be tempted to believe that assessment indicators must be accurate values, well within absolute limits. By studying the anti-aircraft defence actions of Iraqi and Serbian troops in response to air strikes in *Desert Storm* and *Allied Force* operations, we were able to conclude that, in order to change the state of a system and achieve the set goals, it is necessary to determine critical variables, without which you cannot impose MoE. The time, the quality of the technique, the outrunning in the decision (transposed into an action-time relationship), the morale and the amount of timely information are just a few examples of critical references, even though relative.

I can realistically propose to prohibit a direction only if all the conditions are accomplished (technically, tactically and temporarily), without shading the action expressing an unrealistic intention of the enemy. This is why estimating its possibilities and permanent monitoring of actions, together with their own assessment, can determine the approximation of variables and their transposition into acceptable system conditions.

The methods and techniques for assessing the degree of mission accomplishment are also important for any decision-making element. Depending on the aggregation level of the structures, we can apply for a direct or indirect observation, for a checking-interpreting list (Check List) or assessment matrix (Assess Matrix). These can be common or adapted to each situation, with common or independent sources, objective or subjective, detailed or with a high level of generalization. For all these, the evaluators must understand the strengths and

vulnerabilities inherent in the designed assessment framework and ensure the concordance between the conclusions (as created effect) and the initial state (the intention expressed).

Conclusions

The anti-aircraft response, like any combat action, has its *a priori* limits. Accepted by numerous systemic conditioning (sometimes also by previous experiences), these should not affect the generating of an expected reaction effect in conjunction with their own performance and the doctrinal guidance of the decision maker.

In the dynamics of military actions, the importance of valuing the assessment indicators has not only retrospective, *post factum* correction value, but also acquires valences of deductive predictability, leading, inevitably, to action and decision optimization. Their operational function fuels the initiation of new reactions, being the "providers" of the information required by the managerial acts and processes carried out within the dedicated system. In extending this functional dimension we find the optimization of the information-decision-action cycle, an aspect that facilitates the quantification of mission accomplishment.

Regarded by the achievement of the objectives and the performance of the tasks under acceptable conditions and predetermined time, the assessment indicators subordinated to the anti-aircraft response reflect the entropic state of the anti-aircraft fire system, after the final validation. They also provide us with the quantitative and factual basis for the evolution of the projected operation, thus eliminating cognitive errors, empiricism and emotional subjectivism.

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