

Enhancing the Effectiveness of Air Defense Systems through Simulation Analysis

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Abstract : Air Defense Systems contain high-value assets that are expected to fulfill their mission for several years - in many cases, even decades - while operating in a fast-changing, technology-driven environment. Thus, it is paramount that decision-makers can assess how effective an Air Defense System is in the face of new developing threats, as well as to identify the bottlenecks that could jeopardize the security of the airspace of a country. Given the broad extent of activities and the great variety of assets necessary to achieve the strategic objectives, a systems approach was taken in order to delineate the core requirements and the physical architecture of an Air Defense System. Then, value-focused thinking helped in the definition of the measures of effectiveness. Furthermore, analytical methods were applied to create a formal structure that preliminarily assesses such measures. To validate the proposed methodology, a powerful simulation was also used to determine the measures of effectiveness, now in more complex environments that incorporate both uncertainty and multiple interactions of the entities. The results regarding the validity of this methodology suggest that the approach can support decisions aimed at enhancing the capabilities of Air Defense Systems. In conclusion, this paper sheds some light on how consolidated approaches of Systems Engineering and Operations Research can be used as valid techniques for solving problems regarding a complex and yet vital matter.

Keywords : air defense, effectiveness, system, simulation, decision-support

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