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"Adapting C2 to the 21st Century"

Title of Paper: The Impact of Entropic Drag on Command and Control

Track(s): Network Centric Experimentation and Applications, C2 Concepts Theory and Policy, Organizational Issues

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Abstract: A commonly believed axiom in signal detection theory is that "more information is good". That is, when attempting to determine the state of a partially observable system the addition of correct information monotonically improves the correctness of the state assessment. However, when diagnosing a dynamic system such as a military engagement, this assertion is not always true. For complex, dynamical systems the information gain is offset by an increase in entropy due to the dynamic forces within the system. A similar effect occurs when controlling dynamic, stochastic systems. The act of exercising control requires some finite amount of time, during which increasing entropy reduces the efficacy of the control policy. The impact of these entropic forces increases as the complexity and pace of both the system and control apparatus increase. This paper defines a mathematical framework that describes the effect of information and information processing related entropy on the diagnosis and control of dynamical systems. A method for determining the optimal number of observations as well as the optimal number of collaborators for a specific system is shown. Also shown are analytical and experimental results describing the information limitations of network topologies relating to complexity and the pace of operations.

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