

**CYBER RESILIENCY WARGAME SERIES –
ASSESSING CYBER RISK TO MISSION FOR COMBATANT COMMANDERS**

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ABSTRACT

Cyber resilience is typically examined in a stove-piped fashion and not well integrated into systems development, operational planning, and acquisition. Cyber resilience encompasses people, processes, technology and data, BUT technology is the typical focus of weapon system cyber assessments. Cyber resiliency requires a mission assessment of system vulnerabilities. However, two unique perspectives exist within the DoD that need to be integrated.

Combatant Commanders are focused on the “so what” for cyber and have concerns that include but are not limited to: Theater network operations, alignment of scheme of maneuver to dynamic key cyber terrain, and a more complex challenge of synchronizing authorities, C2 and warfare integration to disrupt and defend kill chains that impact the scheme of maneuver.

Acquisition focused commands (OSD and services) must concern themselves with Weapon System Resilience (people, processes, and tools) and enhancing cyber vulnerability assessments. To support warfighting requirements, they must gain a deep understanding of mission impacts. When assessing a system of systems architecture (such as GPS), the analysis must be rooted in systems engineering and address:

- Critical nodes that affect mission performance
- Prioritization of risk with a deeper understanding of threats, vulnerabilities, and mission impact
- Rank order prioritization of investments to exploit (or defend) critical nodes

To meet these challenges, traditional qualitative wargames and exercises can be enhanced with a combined approach of systems engineering analysis, threat awareness, and M&S tools to provide a more discrete assessment of offensive cyber impacts and defensively-oriented cyber resilience.

AUTHOR BIOGRAPHY

MARK W. LUKENS is the Senior Operations Research Analyst for Cyber Analytics within the Office of the Undersecretary of Defense, Acquisition and Logistics. He has developed and is the wargame director for the Cyber Resiliency Wargame series. He is also the lead for the Cyber Mission Model and the Economics of Cyberspace Operations projects for the Department of Defense. Dr. Lukens received his PhD in Computational Science from George Mason University in 2004. He also holds three Master degrees, two from Georgia Tech in Operations Research and in Industrial Engineering, and one from the U.S. Army War College (Strategic Studies). In 1986 he graduated first in Operations Research at the United States Military Academy (USMA). His previous positions at the Pentagon include Division Chief of Program Development, Army G-8, Program Analysis and Evaluation; Division Chief of Manpower and Forces Analysis, Army G-8; Senior Analyst, Projection Forces, OSD Program Analysis and Evaluation; and Branch Chief and Force Structure Analyst, Army G-1. He has also been a research staff member at the Institute for Defense Analysis; Military Deputy for Army Material Systems Analysis Activity at Aberdeen Proving Ground; Director of the NATO ISAF Afghanistan Assessment Group in Kabul (Afghanistan); and an Assistant Professor and Instructor in the Department of Mathematical Sciences at USMA, West Point. He is a retired Army Colonel with over 29 years of active service, including

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