

COMBAT AND COMPLEXITY: USING MODELING AND SIMULATION TO UNDERSTAND THE IMPLICATIONS FOR THE NEXT WAR


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ABSTRACT

Ideas of complexity can be found in the works of Sun Tzu and Clausewitz, so complexity in combat is not a new concept the military community and supporting modeling, simulation, and analysis experts must deal with. However, the amount of complexity increases. Early weapon systems did not reach beyond the direct control of the user. The battlefield could be delimited using organizational boundaries defining areas of responsibility assigned to local units. Today's weapon effects reach beyond the control of the user. Areas of responsibility overlap. Unit boundaries are no longer efficient, but collaboration in the overlapping areas is needed. Today's military operations increasingly rely upon joint, coalition, allied, and combined multilateral forces that are optimized, and task organized. Air, land, sea, space, and cyber operations are being tied together on a multidomain battlefield characterized by non-linear operations in a networked kill web. Such kill webs provide a new form of operational agility that is far beyond current capabilities, but also requires new degrees of weapon system interoperability and a new concepts for battle management command and control. This presentation shows implications for the next war and recommends a closer collaboration with the complex adaptive systems community to benefit from their methods and tools.

SPEAKER BIOGRAPHY

ANDREAS TOLK  is Chief Scientist for Complex Systems Modeling in the Modeling and Analysis Innovation Center at The MITRE Corporation in Charlottesville, VA. He holds a variety of service and editorial roles within the simulation community, including having served on the WSC Governance Board from 2013 to 2021. He has an extensive publication record, including many contributions to the Command and Control Research Program and the System Analysis and Studies Group of NATO's Science and Technology Board. Among 14 other textbooks and compendiums on simulation and systems engineering topics he authored the textbook "Engineering Principles of Combat Modeling and Distributed Simulation," published 2012 by Wiley. He received a PhD and M.Sc. in Computer Science from the University of the Federal Armed Forces, Germany. Andreas is a Fellow of SCS and a senior member of ACM and IEEE. He received distinguished contribution awards from ACM and SCS and was recognized as a "Titan of Simulation" at the Winter Simulation Conference 2021. His email address is atolk@mitre.org.