



## OFFICE OF THE DEPUTY ASSISTANT SECRETARY OF DEFENSE SYSTEMS ENGINEERING

### System of Systems Engineering Collaborators Information Exchange (SoSECIE)

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## A Model-Based Approach to System-of-Systems Risk Management

**Mr. Andrew Kinder, Loughborough University, United Kingdom**

### **Abstract**

This paper discusses the approaches required for risk management of “traditional” (single) systems and systems of systems (SoS) and identifies key differences between them. When engineering systems, the risk management methods applied tend to use qualitative techniques, which provide subjective probabilities. It is argued that due to the inherent complexity of SoS, more quantitative methods must be adopted. The management of SoS risk must be holistic and should not assume that if risks are managed at the system level then SoS risk will be managed implicitly. A model-based approach is outlined, using a central Bayesian Belief Network (BBN) to represent risks and contributing factors. Supporting models are run using a Monte Carlo approach, thereby generating results, which may be “learned” by the BBN, reducing the reliance on subjective data..

### **Author Biography**

Andrew Kinder is a PhD candidate within the Engineering Systems of Systems (ESoS) group at Loughborough University, where he is researching a model-based approach to SoS risk management. The research is being performed concurrently with his role as a Tactical Data Link consultant for ATEQ Consulting Ltd, who provide specialist technical support to the UK MoD and other nations. He has more than 25 years of experience working within the defence industry in systems, software, and consultancy engineering roles. He has also been involved in a wide range of industry based research including error growth in the SoS kill chain, human to human interoperability, and SoS safety issues.