

Complex Engineered Systems

7th Research Consortium for
Multidisciplinary System Design Workshop

*Purdue University, West Lafayette, IN
July 19 and 20, 2012*

Thoughts for Complex Engineered Systems Discussion

- Aerospace systems seem to rapidly increase in complexity over time, where other systems do not show similar complexity growth
- Complexity - the probability of exhibiting unexpected behavior; metric: $\exp(h(Q))$
 - Smallest range uniform random variable that describes what is unknown
 - Idea that model fidelity inversely proportional to model discrepancy
 - Complexity metric estimation must incorporate all sources of uncertainty
- Complexity metric using $\exp(h(Q))$ leads to units of quantity of interest; system could have high complexity w.r.t. on Q , but low w.r.t. a different Q

Thoughts for Complex Engineered Systems Discussion

- Generally agreed upon complex system properties
 - Consist of many parts
 - Parts interact (non-linear)
 - Difficult to model and understand
- What intersection with MDO problem (isn't this what we generally try to address already, at least in general)?
- What role does the consortium / our community have in defining (or refining the definition of complex systems)?
- Value-driven design appears often at recent workshops:
 - Unclear if this is different from what we already do
 - Any insights about this?